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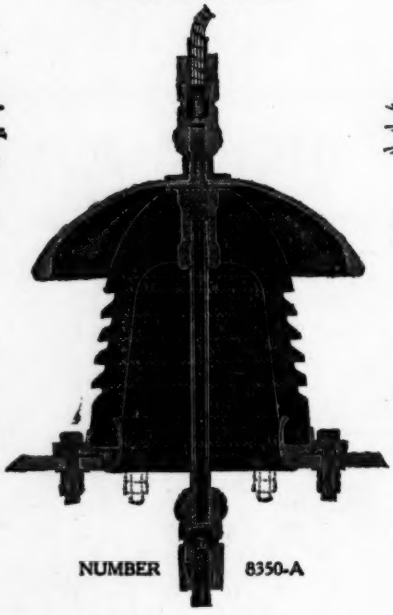

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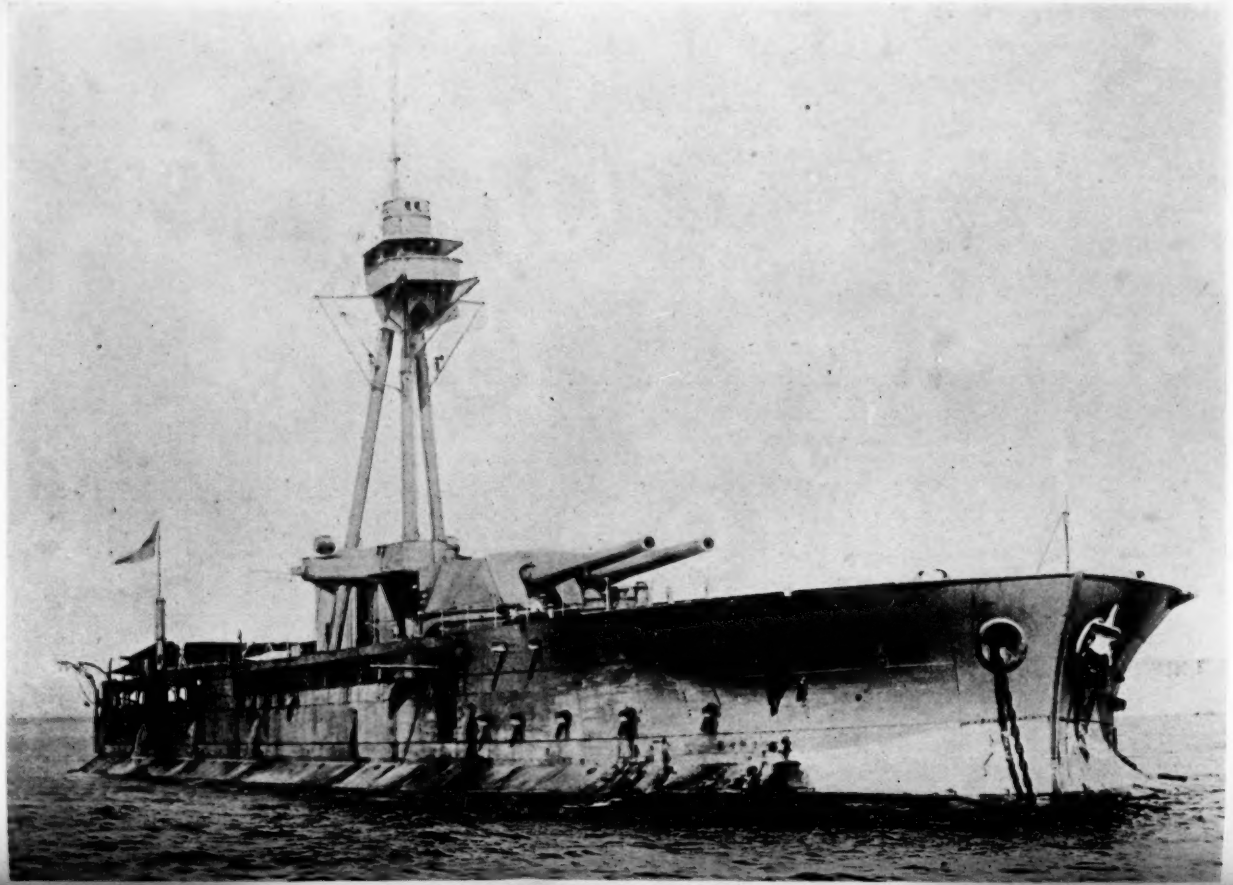

H. M. S. ABERCROMBIE (BRITISH MONITOR).

...ing the 6-inch gun in the fore turret and the heavy armored "blister" at the waterline. This is a protection against submarine attack.

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THE RESULTS AND EFFECTS OF THE BATTLE OF JUTLAND

By Lieut. Commander Holloway H. Frost, U. S. Navy

I. The Military Situation Before the Battle

In order to determine what the results of the battle of Jutland were, it is necessary to establish the salient features of the military and naval situations in Europe before the battle.

At the beginning of June, 1916, the general military situation was very favorable for the Allied Nations. The year of 1915 had been an extremely successful one for the Central Powers. On the eastern front the Russians had been pushed back with heavy losses and crushing defeats; Bulgaria had entered the war and Serbia had been overrun, while the British and French were being decisively repulsed at the Dardanelles. On the western front and in Italy the various allied offensives, although gaining a little ground and some prisoners, were generally favorable to the Central Powers.

At the beginning of 1916 the Central Powers, as the result of their successes of 1915, had sufficient reserves to attempt other offensives. The Germans prepared a powerful drive on Verdun; the Austrians made ready for an attack in the Trentino; the Turks pushed the siege of Kut-el-Amara and prepared defensive positions to hold off relieving armies.

It is somewhat of a remarkable coincidence that each of these three offensives ran the same course; each commenced with striking successes; each ended in virtual failure.

At Verdun very important successes were gained on the first days; gradual progress was made for several months. By May it had become a great battle of attrition. Its final results were decidedly unfavorable for the Germans.

At the middle of May the Austrian offensive commenced. After important initial successes, it also was checked, and ultimately the Italians regained a considerable portion of the ground lost.

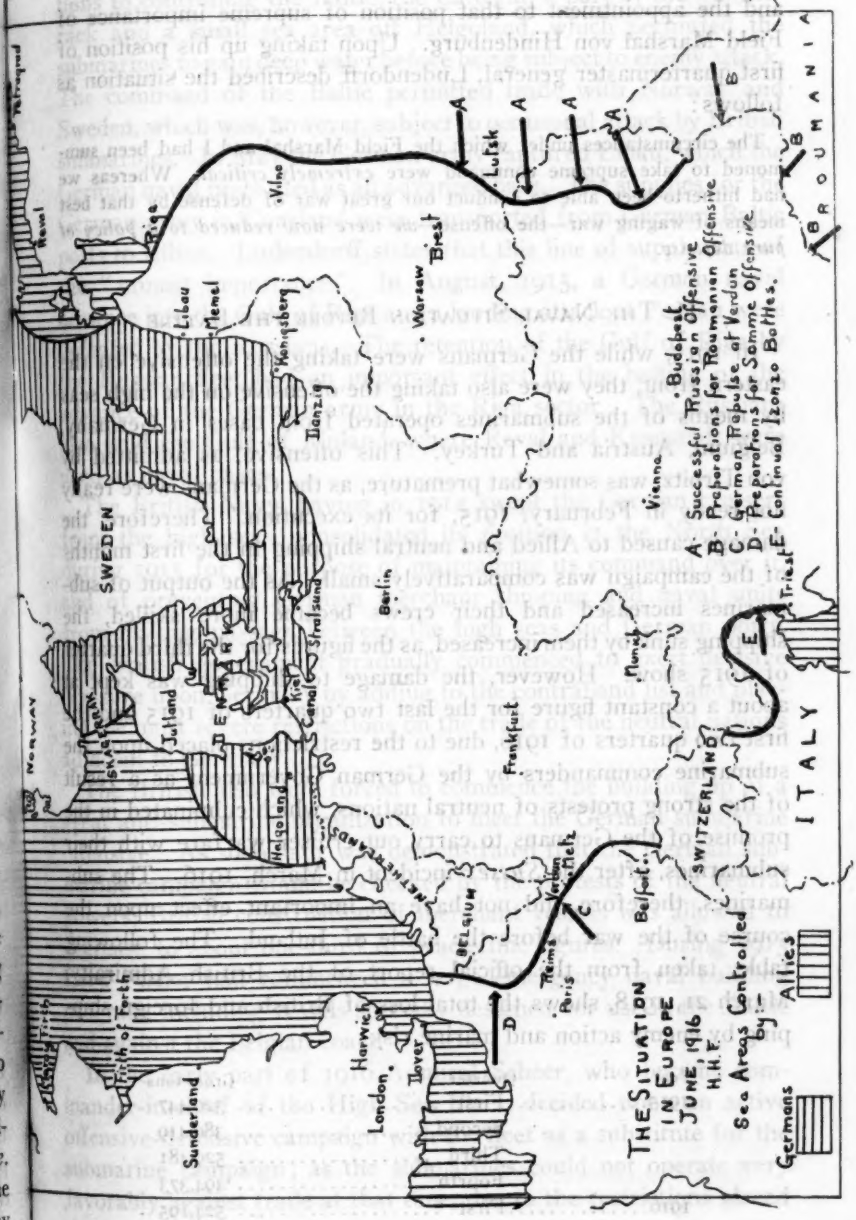
In April the Turks succeeded in taking Kut-el-Amara, but were unable to make any further advance, due probably to the death of Field Marshal von der Goltz, and the arrival of important British reinforcements.

The Central Powers had meanwhile been able to maintain the Russian front despite very heavy attacks on the German part of the front during March. The Macedonian front was stationary. The Russians had broken through the Armenian front, but this was a local success only and could have little effect on the more vital campaigns.

Thus, the three great offensives of the Central Powers had failed, and in failing had practically consumed the entire strategical reserves of their armies. The Allied Nations, with a great superiority of numbers and equipment, seized the initiative on all fronts and prepared for a simultaneous concentric attack, which all supposed would soon bring about a decision.

In France elaborate preparations were made for a great attack astride the Somme River; the Italians made ready for a new Isonzo battle; the Russians were concentrating enormous forces, well equipped with fresh stores of material, for a powerful drive at many points along a wide front; the Saloniki front was being built up in preparation for an advance into Serbia; in Mesopotamia the British were getting ready on a large scale for a campaign toward Bagdad; finally, Roumania had about decided to enter the war on the side of the Allied Nations, thus greatly lengthening the eastern front and throwing a fresh and well-equipped army into the heart of Hungary for the *coup-de-grace*.

The mere beginning of these numerous campaigns brought the removal of the chief of the general staff of the German field army


THE SITUATION IN EUROPE JUNE, 1916
H.H.F.
Sea Areas Controlled by:-
Allies
Germans
A- Successful Russian Offensive
B- Preparations for Roumanian Offensive
C- German Repulse at Verdun
D- Preparations for Somme Offensive
E- Continual Izonzo Battles.
SWEDEN
NORWAY
DENMARK
Jutland
Kiel Canal
Stralsund
Libau
Memel
Königsberg
Danzig
Warsaw
Brest
Lutsk
Vilna
Riga
Reval
Berlin
Frankfurt
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ROUMANIA
ITALY
SWITZERLAND
Belfort
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Metz
Rheims
Paris
BELGIUM
HOLLAND
Helgoland
Harwich
London
Dover
Firth of Forth
Sunderland

and the appointment to that position of supreme importance of Field Marshal von Hindenburg. Upon taking up his position of first quartermaster general, Ludendorff described the situation as follows:

> The circumstances under which the Field Marshal and I had been summoned to take supreme command were *extremely critical.* Whereas we had hitherto been able to conduct our great war of defense by that best means of waging war—the offense—*we were now reduced to a policy of pure defense.*

II. THE NAVAL SITUATION BEFORE THE BATTLE

In 1915, while the Germans were taking the offensive on the eastern front, they were also taking the offensive on the high seas by means of the submarines operated from bases in Germany, Belgium, Austria and Turkey. This offensive, as admitted by von Tirpitz, was somewhat premature, as the Germans were really not ready in February, 1915, for its execution. Therefore, the damage caused to Allied and neutral shipping in the first months of the campaign was comparatively small. As the output of submarines increased and their crews became more skilled, the shipping sunk by them increased, as the figures for the third quarter of 1915 show. However, the damage to shipping was kept at about a constant figure for the last two quarters of 1915 and the first two quarters of 1916, due to the restrictions placed upon the submarine commanders by the German Government as a result of the strong protests of neutral nations, which culminated in the promise of the Germans to carry out cruiser warfare with their submarines, after the *Sussex* incident in March, 1916. The submarines, therefore, did not have an important effect upon the course of the war before the battle of Jutland. The following table, taken from the official report of the British Admiralty, March 21, 1918, shows the total loss of British and foreign shipping by enemy action and marine risk:

Year	Quarter	Gross tons
1915	First	320,447
	Second	380,419
	Third	529,481
	Fourth	494,373
1916	First	524,195
	Second	522,289

The High Sea Fleet during the year 1915 had limited its operations to controlling the Baltic, the Cattegat, a part of the Skagerrack and a small sea area off Helgoland, which permitted the submarines to gain deep water before being subject to enemy attack. The command of the Baltic permitted trade with Norway and Sweden, which was, however, subject to occasional attack by British submarines. In May the German army captured Libau, which the German naval units used as an advanced base. The supplies for the German army in Courland were transported from German Baltic ports to Libau. Ludendorff states that this line of supply was of the "utmost importance." In August, 1915, a German naval advance into the Gulf of Riga and a landing attack at Pernau were defeated by the Russians. The retention of the Gulf of Riga by the Russian fleet had an important effect in the halting of the advance of the German army in the Riga sector. The Russians also held the Gulf of Finland, where Reval and Kronstadt were used as naval bases.

The British Navy, having in 1914 swept the German cruisers from the high seas, consolidated its position in the North Sea during 1915 for the purpose of maintaining its command over it, and of preventing German merchant shipping and naval units from making passage between the high seas and German ports. The British government gradually commenced to exert decisive pressure upon Germany by adding to the contraband list and placing the most severe restrictions on the trade of the neutral nations adjacent to Germany.

The British also were forced to commence the building up of a great anti-submarine organization to meet the German submarine offensive. As soon as it was demonstrated that the German submarine campaign would be checked by the protests of the neutral powers, British construction of merchant vessels was allowed to decrease to about one-third of peace-time figures. During 1915 Lord Fisher had commenced a large emergency naval building program, including vessels specially designed for use in the Baltic and against the Belgian coast.

In the early part of 1916 Admiral Scheer, who became commander-in-chief of the High Sea Fleet, decided upon an active offensive-defensive campaign with the fleet as a substitute for the submarine campaign; as the submarines could not operate very favorably against trade at that time, due to the restrictions placed

on their methods of operation, a number of them were assigned to operate in conjunction with the fleet whenever it put to sea.

On February 11, 1916, Scheer commenced the execution of his campaign with the High Sea Fleet by sending the light cruiser *Rostock* with the destroyer flotillas II, VI, and IX on a raid off the Dogger Bank. This force succeeded in sinking the British sloop *Arabis*.

On March 5 three dirigibles bombed the Humber area and the High Sea Fleet advanced into the approaches to the Channel and returned without making contact with any important British force.

On April 24 six Zeppelins bombed the coastal towns and the German scouting force bombarded Lowestoft and Yarmouth, supported by the whole High Sea Fleet. Contact was made with the Harwich force, which kept out of effective gun range. The *Seydlitz* was mined during this cruise.

Finally, on May 31, Admiral Scheer commenced an advance into the Skagerrack, which developed into the battle of Jutland.

The British forces were well disposed along the eastern coast of Scotland and England to meet the offensive of the High Sea Fleet.

The battle fleet, with its accompanying cruisers, light cruisers and destroyers, was at Scapa. The battle cruiser fleet, with light cruisers and destroyers, was at Rosyth. The mission of these two forces was to scout for and bring to action the German battle fleet whenever it put to sea. Thus, on April 25 they very nearly were able to intercept the High Sea Fleet, and on May 31 they were able to bring it to action.

In addition to these main forces the following less important forces were stationed along the eastern coast of Scotland and England for the purpose of enforcing the blockade, preventing bombardment of coastal cities and, in general, of controlling the sea area along the coast against the attacks of enemy light cruisers, destroyers and submarines:

(a) The tenth cruiser squadron, based on the Shetland Islands.

(b) Light forces based at Scapa, Moray Firth and Firth of Forth.

(c) The third battle squadron and third cruiser squadron, based at the Thames.

(d) The Harwich force.

(e) The Dover patrol.

The Grand Fleet at Jutland had a superiority over the High Sea Fleet of approximately 1.75 to 1, or of 7 to 4.*

In addition to the ships actually present the Germans had one battleship, first line, in commission—the *Konig Albert*—as against four battleships, first line and one battle cruiser for the British—the *Royal Sovereign, Queen Elizabeth, Empress of India, Dreadnaught* and *Australia.*

As a final reserve, the opposing navies had the following large ships, which had been laid down since 1900:

Class of ship	Great Britain	Germany
Battleship, second line	16	11
Cruiser, second line	23	1

The following ships were building and nearing completion:

Class of ship	Great Britain	Germany
Battleship	2	2
Battle cruiser	2	1
Cruiser	3	0

The British cruisers each carried four 15-inch guns and had speeds of 35 knots. Their armor was very light.

Therefore, the British had a reserve of 12 large modern ships as against 4 for the Germans. Back of these there was a further reserve of 39 large second line ships as against 12 for the Germans.

In addition, the other Allied Nations had powerful navies which were largely available as reserves for the Grand Fleet.

The French had 7 battleships, first line, and 10 very good battleships, second line; Italy had 5 battleships, first line, and 4 of the second line. Russia had 4 battleships, first line. On the other hand, Germany's allies had weak naval forces. Austria had 2 battleships, first line, and 6 of the second line. Turkey had 1 battle cruiser.

The total naval strength of Great Britain's allies therefore amounted to 16 ships of the first line and 14 of the second, while Germany's allies had a total of 3 ships of the first line and 6 of the second. This omits all cruisers, light cruisers and destroyers; in all of these classes the Allied Nations were greatly superior.

* In the article "The High Sea Fleet at Jutland" the number of German destroyers was estimated as 77 and their aggregate displacement as 60,300 tons. A letter from the German Admiralty to the writer gives 65 destroyers present with an aggregate displacement of 62,203 tons. 32 were with Hipper and 33 with Scheer.

Let us now see what the probable result of an action between the two fleets would be. In order to give the benefit of doubt to the Germans, we will assume that they were slightly more efficient, ship for ship, and that their fleet would be handled somewhat better than the Grand Fleet. Nevertheless, admitting these advantages, it still seems evident that they had only a remote chance of coming out of a fleet action with losses as small as those of the British. It would require a most extraordinary combination of skill and luck if the Germans were to inflict losses in the ratio of 7 British units to 4 of their own. Nevertheless, the British could well afford to receive losses in this ratio, even to the total destruction of both forces engaged, unless they were influenced by considerations of future difficulties with the United States or one of their allies. This was the maximum success the Germans could have won in a battle fought to a decision.

In this extreme case, even, the British had such reserve strength as to assure them the continued control of the North Sea.

This control might have been somewhat less effective than before, because the Germans might gain the following advantages:

(a) A better exit of their submarines from German ports.

(b) Better opportunities for raids on the trade between England and Norway.

(c) Better chances for successful raids on the English coast.

(d) An easier passage for raiders between Scotland and Norway.

(e) A lessening of the British anti-submarine effort, due to the necessity to reinforce the Grand Fleet with vessels previously engaged in this duty.

It will be at once seen that these possible advantages would give the Germans no decisive benefit, and, in fact, the situation would soon reduce to that which obtained before the battle; probably it would be even more favorable to the British.

It has been generally recognized at the Naval War College that in a naval battle the damage inflicted is not merely in proportion to the numbers engaged, but in proportion to the square of these numbers. Having this in mind, it would seem that the British could expect to inflict two or three times the losses they received and had almost a certainty of coming out of the battle with less losses than the enemy. This meant that, if they could come to

close action, they could expect to wipe the German fleet from the board.

The destruction of the German fleet would have had the following results:

(a) The German submarines would have been mined in, and the great submarine campaign would have been greatly decreased in effectiveness.

(b) A great part of the British Navy could have been demobilized and the building of naval units and merchant shipping stopped, thus releasing personnel and material for the armies.

(c) The British Navy could have penetrated into the Baltic and controlled that sea area.

(d) The German Baltic coast could be attacked, thus drawing troops from the land fronts.

(e) The British Navy, working with the Russians, would probably have held together the Entente Alliance.

(f) England could have supplied Russia through the Baltic.

(g) These measures, together with the other successful allied offensives on land would, in all probability, have decided the World War in 1916.

III. THE MATERIAL AND PERSONNEL LOSSES OF THE BATTLE

It has been definitely and finally determined that the following vessels were sunk in the battle, or as a result of damage received in it:

BRITISH		GERMAN	
Ships	Displacement	Ships	Displacement
Queen Mary	26,350	*Lutzow*	26,700
Indefatigable	18,800	*Pommern*	13,200
Invincible	17,250	*Wiesbaden.*	
Defense	14,600	*Elbing.*	
Warrior	13,550	*Rostock.*	
Black Prince	13,350	*Frauenlob*	17,150
Tipperary	1,430	*V-4.*	
Turbulent	1,100	*V-27.*	
Fortune	965	*V-29.*	
Ardent	935	*S-35.*	
Shark	935	*V-48*	3,680
Sparrowhawk	935		
Nestor	890	Total	60,730
Nomad	890		
Total	111,980		

The British total losses in vessels sunk were greater than the German in the ratio of 1.84 to 1. If we were to exclude the second line ships from the total, the British losses would be 70,480 and the German losses 44,815; then the British losses would be greater in the ratio of 1.59 to 1.

Commander Bellairs gives the personnel losses as follows:

	British	German
Officers killed	343	172
Officers wounded	51	41
Men killed	6104	2414
Men wounded	513	449
Total	7011	3086*

The British personnel losses were greater than the German losses in the ratio of 2.27 to 1. These losses were even more disadvantageous to the British because they lost two rear admirals with their entire staffs and six captains as against the three captains lost by the Germans.

The damage to ships which did not sink may be indicated by the hits received and the personnel losses caused by the hits. In the case of battleships, battle cruisers and cruisers only heavy caliber hits are counted, all small caliber hits and shell splinters being omitted. In the case of light cruisers all hits of every caliber are counted.

DAMAGE TO BATTLESHIPS, BATTLE CRUISERS AND CRUISERS

BRITISH			GERMAN		
Name	Heavy hits	Casualties	Name	Heavy hits	Casualties
Lion	12	44	*Derfflinger*	19	179
Princess Royal	9	70	*Seydlitz*	21	149
Tiger	4	62	*Moltke*	4	38
New Zealand	1	None	*Von der Tann*	4	47
Indomitable	1	None	*Markgraf*	5	17
Barham	6	59	*Grosser Kurfurst*	8	33
Malaya	7	96	*Konig*	10	65
Warspite	27*	Unknown	*Kaiser*	2	None
Colossus	2	5	*Helgoland*	1	None
			Holstein	1	10
Total	69		Total	73	

* The German Admiralty states that 2545 were killed or missing and 494 wounded.

* Unofficial report.

The number of heavy hits received by the Germans was therefore greater than those received by the British in the ratio of 1.14 to 1. In addition, the British had the *Marlborough* torpedoed, while on the German side the *Seydlitz* was hit by a torpedo and the *Ostfriesland* mined.

DAMAGE TO LIGHT CRUISERS

BRITISH			GERMAN		
Name	All hits	Casualties	Name	All hits	Casualties
Southampton	20*	89	*Frankfurt*	4	21
Dublin	13	Unknown	*Pillau*	1	26
Chester	20*	81	*Stettin*	2	35
Castor	10	35	*München*	5	25
Calliope	1	21	*Hamburg*	4	38
Canterbury	1	None			
Galatea	1	None	Total	17	
Falmouth	1	None			
Total	67				

The British therefore suffered greater damage to their light cruisers than did the Germans. The British also had more destroyers damaged.

In a final consideration of the losses it must be borne in mind that a ship sunk represents a damage many times more serious than one which is so badly damaged that it is just able to get into port before sinking. None of the ships sunk were replaced during the whole war by vessels of their type commenced after the battle; on the other hand, the *Derfflinger* and *Seydlitz*, which were damaged far more than any other ships, were ready after six months of repairs, while all the other ships, both British and German, were ready within two and one-half months from the date of the battle.

Furthermore, to build new ships requires a great amount of expensive material and the services of numerous skilled workmen; to repair ships but little new material is needed, and the personnel, while fairly numerous, is needed for a very much shorter period.

The personnel losses, particularly in officers, represent a very serious loss to a naval service.

Giving due weight to these considerations, it seems fair to estimate the British losses as approximately 1.75 times as great as the

* Estimated.

German. In other words, the losses were in proportion to the forces engaged. Thus, at the end of the battle the British still held the superiority over the Germans which they had before it was fought.

IV. THE MORAL EFFECTS OF THE BATTLE

The moral effects of the battle must be considered under two headings:

(a) The effect upon the navies.

(b) The effect through the civil population, the armies and the population of the neutral nations.

Neither Jellicoe nor Beatty in their official reports claimed a success or victory. Jellicoe sent a message of congratulation to Beatty as follows:

> Please accept my sincere congratulations on the action of the forces under your command under the difficult and disadvantageous conditions of light and weather which existed for you. The heavy losses, which I deeply deplore, appear to be largely due to these conditions, and your ships inflicted very severe damage to the enemy, although the great defensive strength of their ships saved more from becoming total losses. Words cannot express my deep sympathy with relatives and friends of the gallant officers and men who have gone under.

These are not the words of an admiral who has won a battle.

The message of the King to the fleet does no more than mention the "gallantry of the officers and men," and state his "confidence in the valor and efficiency of the fleets."

In his official report Admiral Jellicoe says:

> The disturbing feature of the battle-cruiser action is the fact that five German battle cruisers engaging six vessels of this class, supported after the first 20 minutes, although at great range, by the fire of four battleships of the *Queen Elizabeth* class, were yet able to sink the *Queen Mary* and the *Indefatigable*.

Again the Admiral writes:

> The experience and results of the action, particularly the knowledge we now have of the speed of the enemy's third squadron, must exercise considerable influence on our future dispositions and tactics. It will, for instance, not be advisable in future to place our fifth battle squadron in a position removed from support.

Finally this interesting statement is made:

> The German organization at night is very good. Their system of recognition signals is excellent. Ours is practically nil. Their search-

lights are superior to ours, and they use them with great effect. Finally, their method of firing at night gives excellent results. I am reluctantly compelled to the opinion that under night conditions we have a great deal to learn from them.

These statements demonstrate the following facts:

(a) The British battle cruisers were not capable of engaging the German battle cruisers under equal conditions. There is reason to believe that this was the opinion of those who served on the British battle cruisers.

(b) The fifth battle squadron, according to the opinion of the commander-in-chief, was capable of operating only with the fleet. This to a great extent threw away the advantages of its high speed and weakened the position of the battle cruisers still more.

(c) The British would not risk a general engagement at night and probably would not even attack with destroyers. A striking example of this occurred on August 19, when Commodore Tyrwhitt gained contact with the High Sea Fleet at nightfall. "The conditions," writes Jellicoe, "for night attack proved to be unfavorable, and at 7.30 p. m. the commodore reported that he had abandoned the pursuit."

While these facts doubtless made certain of the British forces less eager for battle, it is certainly a fact that the entire Grand Fleet would have welcomed another fleet action under equal conditions in the open sea. It is also a fact that the battle exposed the many deficiencies of the British ships and material, which were made good with great energy. It is probable that the morale of the Grand Fleet, all things considered, was as good after the battle as before it, and particularly after the depressing effects of the losses had worn off.

Let us now examine the situation from the German point of view.

In his official report Scheer claimed a success. His very interesting summary reads as follows:

The success obtained is due to the fact that our squadron and flotilla leaders were filled with zeal for battle, and realized the object of the undertaking, and to the excellent work performed by the ships' companies, who were imbued with the greatest martial ardor.

Its achievement was only rendered possible by the quality of our ships and armament, the fact that the peace training of the units was conscious of its object, and by the conscientious training carried out by the individual ships.

The large amount of experience gained will be exploited with the greatest care.

The battle has proved that in building up our fleet, and the development of the individual types of our ships, we have been guided by correct and strategical views, and that we should, therefore, continue on the same lines.

All arms have borne their share in this result; the decisive factor was, however, the long range heavy armament of the *larger vessels.** It caused the greater part of the known losses inflicted on the enemy, and it enabled the flotillas to carry out a successful attack against the enemy's Main Fleet. The above observation in no way detracts from the merit of the flotillas, whose attack on the enemy battlefleet was finally successful in enabling us to break away completely from the enemy.

The *large war vessel*, battleship and cruiser, is and remains, therefore, the foundation of sea power, and should be further developed by enlarging the caliber of the guns, increasing the speed and perfecting the armor above and below the water.

These paragraphs show that Scheer was completely satisfied with the personnel and material of his fleet. While Jellicoe expressed satisfaction with his personnel, he criticized very severely the material development of his fleet in many respects.

The Austrian Naval Attaché to Berlin visited the fleet immediately after it returned to port and made an official report to the Austrian Admiralty. This report has every evidence of accuracy, and has the advantage of not being a public statement written for propaganda purposes. His report confirms the opinions of Admiral Scheer. In addition he makes the following comment upon the morale of the High Sea Fleet:

The fleet is absolutely *enthusiastic* and intoxicated with victory; the terrible incubus, the dread which weighed on everybody, namely, that the war should end without a meeting of the two fleets, has vanished. . . . . The entire fleet down to the last sailor has faith in its strength and in the possible conflicts of the future.

Despite the satisfaction of the Germans with the result of the battle and the temporary enthusiasm of their personnel, they realized that the numerical superiority of the British and their advantages of position would prevent the High Sea Fleet from ever gaining the command of the sea. Admiral Scheer admitted this and therefore urged the resumption of unrestricted submarine warfare. This not being approved at that time, he continued his campaign with the High Sea Fleet in the North Sea in a manner similar to its operations before the battle; in fact his operation against Sunderland on August 19 was the most ambi-

tious of his sorties into the North Sea. There is no evidence that the morale of the German commander-in-chief or that of his fleet was lowered by the battle of Jutland.

It is true that the morale of the fleet became bad in the latter part of 1917. The reasons for this were as follows:

(a) After January, 1917, unrestricted submarine warfare was commenced. This drew the best officers to the submarines; picked men were also taken from the fleet for the submarines. The morale of the submarines was good to the very end.

(b) All the navy yard facilities were used for the building and repair of submarines, and the material condition of the fleet deteriorated.

(c) As all the submarines were used against trade, none could be assigned to the fleet for combined operations, as was the case in 1916.

(d) For these reasons, it was not considered advisable to operate the fleet as aggressively in 1917 and 1918 as in 1916. The enforced idleness, the lack of food, and the pernicious activities of the Independent Socialists then combined to undermine the morale of the German Navy. It is not considered that the results of the Battle of Jutland contributed to this condition.

It now remains to consider the moral effect of the battle upon the civil population and armies of the belligerents, and upon the neutral nations.

In the German army the effect of the battle was favorable. Before the action there was doubtless a feeling that, while the troops were suffering terrible losses in battle, the fleet was remaining safe in port. The battle dispelled this feeling and doubtless encouraged the army, which at this time was being tested to the very limit.

Throughout Germany there had doubtless been some dissatisfaction at the lack of action on the part of the fleet, which had cost such enormous taxes before the war. The battle brought home the uses and accomplishments of the fleet, and as the Germans worked their propaganda very skillfully, the effect through their country was certainly very favorable. "That it gave the German people," writes Commander von Hase," new strength and confidence, and contributed greatly to their prestige, there can be no question."

It is considered that the German Admiralty made a mistake in concealing the loss of the *Lutzow*. Admiral Scheer states that this was not done at his request, saying: "Unfortunately the secrecy observed produced the impression that it was necessary to enlarge our success to that extent." The Germans had good reason to be proud of the accomplishments of their fleet, without concealing any of its losses.

In the Allied Nations and among the neutrals the effect was particularly disadvantageous. This was partly due to the very high reputation which the British Navy had maintained through hundreds of years of history, and the fact that the German Navy was a new development and had never been tried in a fleet action. These considerations led the neutral nations to expect a complete victory, or at least that the German losses would be much heavier than the British. Therefore, the first startling German accounts had a tremendous effect upon public opinion. These impressions were increased by the admission by the British of the greater part of the German claims.

Then, to counter the unfavorable situation, the British used two lines of propaganda. The first was to blame the results of the battle upon the unfavorable weather condition. This proved a most unfortunate line, for people familiar with naval history remembered what Hawke had said and done at Quiberon Bay. Here this famous old admiral reported that he saw the necessity he "was under of running all risks to break the strong force of the enemy." Following the French fleet, he entered the bay in a gale just as darkness was coming on. Being warned by his sailing master, who protested strongly against his entering the bay, Hawke replied: "You have done your duty in warning me; now lay us alongside the French commander-in-chief." Also it might have been recalled that mist prevented Calder from capturing more than two ships from Villeneuve in the battle off Cape Finisterre in 1805, and that Calder had been censured by a court-martial of his brother officers.

The second course of action was to claim that the German losses were very much greater than they actually were. In addition to the true losses, the British claimed certain or probable losses of three battleships, one light cruiser, four destroyers, and one submarine. The German claims, although also exaggerated, were modest in contrast with these. Doubtless this line of propaganda

had some effect, but the very necessity for using such methods had a bad effect upon those who could not be convinced that the British claims were true.

Taken all in all, the battle of Jutland had a favorable moral effect for the Germans and was a very heavy blow at British naval prestige.

V. THE EFFECTS OF THE BATTLE UPON THE COURSE OF THE WAR

As it was known that many of the vessels of the High Sea Fleet were severely damaged, the Grand Fleet did not put to sea during the month of June. This period was utilized to effect important repairs and to carry out certain alterations proved necessary by the battle. Practically all the repairs were completed by the first week in July. The *Chester* rejoined on July 29 and the *Marlborough* on about August 5.

During the month of July the Grand Fleet put to sea but once, and this time for an exercise cruise of three days in the vicinity of the Shetlands. On the night of the 24th the *Warspite* and *Valiant* collided in Scapa Flow and had to be docked.

On August 18 the Grand Fleet started on a sweep into the southern part of the North Sea.

When the High Sea Fleet arrived in port on June 1, all damaged ships were sent to navy yards or private shipbuilding companies to repair their damages. By the middle of August all the ships were ready for service except the *Derfflinger* and *Seydlitz*. The new battleship *Bayern* joined the fleet.

Admiral Scheer then put to sea with the intention of carrying out his original plan of a raid on Sunderland. During the 18th there were numerous contacts between the German submarines and the units of the Grand Fleet; the light cruiser *Nottingham* was sunk as the result of three torpedo hits; the *Falmouth* was hit by four torpedoes before sinking; on the other hand the battleship *Westfalen* was torpedoed by a British submarine, not, however, being seriously damaged. In the late afternoon the two fleets were nearly in contact, but Scheer refused action and succeeded in withdrawing just in time. In fact, the Harwich force did make contact with him and was in a position for a night destroyer attack. The British refused to attack, because, as Jellicoe reports, "the conditions for night attack proved to be unfavorable."

In this operation, the Germans declined a day action and the British one at night. Neither fleet was willing to engage, except under conditions which were favorable to it. The actual losses of the British were heavier than those of the Germans, and the success of the German submarines had a very decided moral effect upon the British. This is shown by the following statements of Admiral Jellicoe:

> The experience of August 19th showed that light cruisers, proceeding at even the highest speed, unscreened by destroyers, ran considerable risk from enemy submarines. The enemy's submarine commanders were no doubt increasing in efficiency, and risks we could afford to run earlier in the war were now unjustifiable. Representations were made to the Admiralty to the effect that it was considered that in the future light cruisers should be screened by at least one destroyer per ship.
>
> The ease with which the enemy could lay a submarine trap for the fleet had been demonstrated on the 19th of August; what had constantly puzzled me was that this had not been done very frequently at an earlier stage in the war. Since, however, it had been attempted and with some success, there seemed to be every reason to expect a repetition of the operation, and it was clear that it was unwise to take the fleet far into southern waters, unless an adequate destroyer force was present to act as a submarine screen for all ships. If the circumstances were exceptional and the need very pressing, it would be necessary to accept the risk. There was general agreement on this point between the flag officers of the fleet and the Admiralty.

This decision made the German control of the North Sea area off Helgoland considerably more secure, gave the German submarines a safer exit from their bases and made it practically impossible for the High Sea Fleet to be brought to action. In accordance with this principle none of the battle squadrons of the Grand Fleet ventured much to the southward of Scapa Flow while Admiral Jellicoe remained in command. The battle cruiser fleet made several cruises toward the Skagerrack, and the light cruisers made reconnaissance off the German minefields. The British submarines maintained a patrol off Horn Reef, and in the Skagerrack.

On the other hand, Admiral Scheer planned additional sorties into the North Sea. However, he apparently was not willing to risk a fleet action during these operations, for the one planned for September was cancelled because the weather was not suitable for dirigible scouting. In October an operation with the High Sea Fleet into the center of the North Sea was carried out, but the attempt to attack trade between England and Norway was without result, and no contact was made with the British forces.

Scheer's naval campaign with the High Sea Fleet had been practically checked, and the status at the end of 1916 was almost the same as at the beginning. His operations had a favorable moral effect throughout the world, and they had reflected great credit upon him and the High Sea Fleet. Nevertheless, nothing had been accomplished to break the British blockade; all that could be done was to maintain the present situation in the North Sea and the Baltic; the maintenance of this situation was of great importance for the Germans, and the offensive operations of the High Sea Fleet in 1916 had rendered the defensive position of Germany more secure.

After the results of the battle of Jutland had been carefully analysed, Scheer in his report of July 4, had stated the following opinion:

> Should the future operations take a favorable course, it may be possible to inflict appreciable damage on the enemy; but there can be no doubt that even the most favorable issue of a battle on the high seas *will not compel England* to make peace in *this* war. The disadvantages of our geographical position compared with that of the Island Empire, and her great material superiority, cannot be compensated for by our fleet to a degree which will enable us to overcome the blockade instituted against us, or to overpower the Island Empire herself, even if all our submarines are available for military purposes.
>
> A victorious termination of the war within reasonable time can only be attained by destroying the economical existence of Great Britain, namely, by the employment of submarines against British commerce.

This opinion had been constantly gaining ground in the German Navy and in the Government. It is shown by a statement made by Scheer in November, 1916:

> The dangers which threaten our *U*-boats on these expeditions are so great that they are justified in demanding the utmost support that the fleet can give them in time of need. On no account must the feeling be engendered amongst the crews that they will be left to their fate if they get into difficulties. Fear of loss or damage must not lead us to curb the initiative in naval warfare, which so far has lain mostly in our hands. To us every *U*-boat is of such importance that it is worth risking the whole available fleet to give it assistance and support.

From now on the main mission of the High Sea Fleet became the support of the submarines; they, instead of the capital ship, became the chief weapon used in the German offensive on the High Seas. From now on the Germans made their attack directly on British trade and not on the Grand Fleet. In the last quarter of 1916, the shipping losses increased over 100 per cent.

Admiral Jellicoe was fully alive to the situation. He considered that the Germans would not risk a fleet action for some time, but he was greatly concerned with "the ever-growing danger of the submarine to our sea communications, and the necessity for the adoption of the most energetic measures to deal with this danger." To meet this danger he was called to the Admiralty to become First Sea Lord.

On land the war had been a rapid succession of reverses for the Central Powers. In Galicia the Austrian army had completely collapsed before the Russian attacks; almost one-half million prisoners were taken, and it was only by throwing in all the German reserves that even a semblance of a front was maintained.

General Ludendorff paints the picture on the eastern front with most vivid colors:

> Those were terribly anxious days. We gave up everything we had, knowing full well that if the enemy were to attack us no one could help us. And that is just what happened. On July 16 the Russians, in enormous force, poured out from the Riga bridge-head west of the Dvina and gained ground at once. We went through a terrible time until the crisis was overcome, thanks to the valor of the troops and the careful handling of affairs by the Headquarters Staff of the Eighth Army, which was compelled to use single battalions and batteries as reserves. These battles were not over yet at the end of July, when there were sure indications that the attacks at Baranovici and along the whole course of the Stockod would be resumed. We awaited these with a sinking heart, for our troops were exhausted and had long fronts to defend. The Austro-Hungarian troops had lost all confidence in themselves, and needed German support everywhere.

On July 1 the Allied attack on the Somme commenced with initial successes and developed into a grinding battle of attrition. The Allies, having a great superiority in numbers and enormous advantages in artillery, could afford such a battle better than could the Germans. As the battle progressed through August and September, the German losses became heavier and heavier, the divisions more and more exhausted and it was really with the utmost difficulty that the front was maintained.

On August 1 the Italians broke through the Austrian positions, took Gorizia and captured a large number of prisoners.

On September 1, to cap the climax, Roumania entered the war and commenced the invasion of Hungary with a fresh and well-equipped army. On the 7th an Allied offensive on the Mace-

donian front commenced; this resulted in the ultimate capture of Monastir by the Serbians.

Professor George H. Allen thus describes the situation:

> The central empires quivered under the terrific pressure both on the east and west and there was imminent danger that the Galician front would collapse. In the midst of the Battle of the Somme the Germans were compelled to transfer reinforcements from the west to restore the wavering Austro-Hungarian lines. From the beginning of the Russian offensive on June 4th until the middle of September as many as sixteen infantry divisions appear to have been shifted from the western to the eastern front; while seven Austro-Hungarian divisions were transferred from the hard pressed Italian front, and two divisions were contributed by Turkey. Time will probably reveal further evidence of the intensity of the crisis.

Can there be any doubt but that British naval forces controlling the Baltic and operating in combination with the Russian armies would have brought the war to an end during the last months of 1916?

As it was the Central Powers gradually consolidated their positions on all fronts, concentrated what slight reserves they could make available, and overran Roumania. Thus for the time, their defensive positions were secure. But war cannot be won without attacking. Where were the Germans to attack? On all the land fronts, the Allied Nations had a great superiority. The attack must be made on the sea. Here the Germans still had the submarine weapon. In desperation, like a gambler playing his last card, Germany announced the decision to make use of this last instrument of war which gave hopes of compelling their enemies to sue for peace—the submarine. "The strategic offensive," writes Scheer, "passed definitely to the navy on February 1, 1917. U-boats and the fleet supplemented each other to form one weapon which was to be used in an energetic attack on England's might. Our fleet became the hilt of the weapon, whose sharp blade was the U-boat."

Here we see the paradox of the nation with the greatest army standing on the defensive on land, and the country with the greatest navy forced to the defensive at sea.

The submarine offensive was the important event of 1917. Many authorities have told how near the submarine came to winning the war for Germany. "The danger which confronted the British peoples was never so great in any previous period as it was

during the year 1917 when the submarine menace was at its height." (Jellicoe.)

It is doubtful whether there is any case in history where a navy as weak in comparative fighting strength as was the German, and as poorly based as regards strategic position, has accomplished such important results, by means of methods, however, which the great majority of nations have considered as inhuman and contrary to the principles of international law.

The submarine accomplished the following results in 1917:

(a) Encouraged the armies and civil population of the Central Powers by giving them hopes of ultimate victory.

(b) Brought Great Britain to the verge of starvation and depleted the stocks of fuel oil to such an extent that the operations of the Grand Fleet were limited. "So many vessels were sunk," writes Admiral Jellicoe, "that our reserve of fuel oil became perilously low. Instead of a reserve of some five or six months we were gradually reduced to one of about eight weeks, and in order to economize expenditure of fuel it actually became necessary at one time to issue directions that the speed of oil burning warships was to be limited except in cases of the greatest urgency. Such an order in war time was a matter of much gravity."

(c) Caused a great material loss to the Allies by the sinking of merchant shipping and the loss of cargoes. The tonnage, according to British official reports, lost by Allied and neutral nations was as follows:

Year	Quarter	Gross tonnage
1916	Third	592,039
	Fourth	1,159,343
1917	First	1,619,373
	Second	2,236,934
	Third	1,494,473
	Fourth	1,272,843

(d) Compelled the Allies to dissipate their energies in building merchant shipping at the expense of their military efforts. The increase of British tonnage built is shown by the following table:

Year	Quarter	Gross tonnage
1916	Third	124,961
	Fourth	213,332
1917	First	246,239
	Second	249,331
	Third	248,283
	Fourth	419,621

(e) Forced the Allied Nations to build up great anti-submarine organizations, composed of numbers of ships and personnel many times those employed by the Germans in the submarine campaign. The British alone had 3395 auxiliary patrols in commission in British and Mediterranean waters.

(f) Operated very effectively against the lines of communications to the Allied forces on the Macedonian front and greatly limited their operations.

(g) Reduced Italy to a very precarious situation and strongly influenced the collapse of the Italian armies on the Isonzo front.

(h) Enabled the Germans to hold the western front. In a conference on July 13, 1917, General Ludendorff stated:

> The superiority of our western opponents in war material, particularly in guns and ammunition, was so great last year that if it had gone on increasing—*i. e.*, by the unrestricted import from America and the maintenance of the enemy's war industries at their highest level—we should have been faced with serious dangers on the western front in 1917. These dangers could only have been diminished by the unrestricted submarine campaign. *If it had not begun no one could say whether we should now still be holding firm on the western front.*

The decision of the Germans to use submarine warfare, on the other hand, brought the United States into the war; and this ultimately decided the war in the favor of the Allied Nations, after the submarine campaign had failed to gain the decision for Germany. There is no evidence to support the German claims that the United States would have entered the war merely to come to the assistance of the Allies, and without the provocation afforded by the submarine campaign.

The effectiveness of the submarine campaign was made possible by the failure of the British to win a decisive victory at the battle of Jutland. Such a victory and a subsequent move of the British into the Baltic would have decreased the results of the submarine campaign in the following ways:

(a) Closed the Cattegat to German submarines, thus shutting off one of their two lines of advance into the North Sea. Even as late as the Fall of 1917, Admiral Jellicoe stated that a British advance into the Baltic was "not impossible," notwithstanding the fact that the entire High Sea Fleet was then in being. Such an operation could not, of course, have been carried through under these conditions, as it would have left the Germans with a superiority in the North Sea.

(b) Prevented German trade with Sweden and thus decreased the supply of material for constructing submarines.

(c) Damaged by bombardment or aircraft attack shipyards on the Baltic coast engaged in the construction of submarines.

(d) The heavy personnel losses which the High Sea Fleet would have suffered would have prevented the submarines from obtaining picked personnel from this source.

(e) The passage of the submarines to and from the North Sea via Helgoland would have been more difficult, as minefields could have been laid comparatively close in to the German bases and would have been more effective than the barrages laid between the Orkneys and Norway. It is not considered that the German bases could have been completely blocked, for, as Commander von Hase points out, " the submarine warfare had been conducted from Flanders without the fleet under much more difficult conditions than those in the North Sea."

(f) A great part of the destroyers, light cruisers, sloops, minesweepers, trawlers, submarines and patrol vessels of various types, which had been operating with the Grand Fleet, could have been assigned to anti-submarine operations. As it happened, these forces were increased. Efforts to obtain destroyers for anti-submarine operations were vetoed by the commander-in-chief, Grand Fleet and the Admiralty. " Those who argued then," wrote Admiral Jellicoe, " or who have argued since, that we should have reduced the number of destroyers with the Grand Fleet will not, I think, meet with any support from those who served in that fleet, *especially from the officers upon whom lay the responsibility for countering any move of the High Sea Fleet.*" Referring to a later date he says: " The Admiralty was pressed to weaken yet further the Grand Fleet destroyer force in order to extend the convoy system, *but did not consider such a course justified in view of the general naval situation.*"

(g) A great part of the capital ships of the Grand Fleet could have been placed out of commission, and their personnel and the energy expended in their upkeep could have been used in anti-submarine operations. As an alternative, these ships could have been kept in commission and used directly against the enemy forces, in the same way the Federal naval forces in the Civil War, having no Confederate fleet to consider, were employed.

(h) The four great battle cruisers of the *Hood* class, whose construction was commenced just after the battle of Jutland, would not have been required, and merchant ships or anti-submarine craft could have been built in their place.

The second great event of the year 1917 was the collapse of Russia. This was caused by the following:

(a) The terrible losses suffered by the Russians in 1914, 1915 and 1916.

(b) The general inefficiency of the Russian Government, which practically broke down in 1917.

(c) The intrigues of the Bolshevists, assisted by German propaganda.

(d) The rout of the Russian Army in Galicia in July, 1917.

(e) The German Riga offensive in September, 1917.

(f) The operation of the High Sea Fleet in October, 1917, which resulted in the Germans gaining the command of the Gulf of Riga, and the capture of Oesel and Moon Islands at its mouth.

Many of these causes of the Russian collapse can be traced to the failure of the British to make the most of their opportunities at Jutland. Had the British been able to control the Baltic, they would probably have been able to have prevented this great disaster to the Allied arms, or, at least, to materially delayed it.

Direct communication would have enabled the Allies to bring diplomatic pressure upon Russia to much greater effect than was actually done. Supplies for the Russian Army would not have had to be sent through Archangel. Allied propaganda would have been more effective. Allied troops could have been sent in to reinforce the Russians at important points, such as at Riga. The presence of a British fleet in the Baltic would have greatly encouraged the Russians, and lowered German influence in Sweden, Norway, Denmark and Finland. It would have cut the German sea communications to Libau, have prevented the Riga operation, and rendered impossible the naval attack on Oesel Island. In addition, the German expedition to Finland in 1918 would have been prevented. All these advantages would almost certainly have kept up such Russian resistance as would have prevented the German concentration on the west front for their great 1918 offensive.

It has been shown how the Germans reached their high-water mark in the spring of 1916; then the tide had turned in favor of the Allies and they had come within an ace of winning the war in the fall; a naval victory had been all they needed to gain the decision.

In the winter of 1916-1917 the Germans had started to gain ground. In 1917 the Germans had continued to make progress, the effectiveness of the submarine campaign, the collapse of Russia, and terrible defeat of the Italians on the Isonzo marking the stages of their advance. In the fall of 1917, they regained the offensive rôle on the western front at the great counterattack at Cambrai. The submarine campaign having failed to win a decision, the German leaders concentrated all their forces on the western front for a final great campaign.

But while the year 1917 had certainly revived the fortunes of the Central Powers and had by outward successes greatly encouraged the civil population, two great and almost unseen influences were slowly but surely exerting their pressure, and building up forces to meet the great German offensive which was threatened.

The first was the steady and remorseless pressure of the British blockade of the Central Powers. As the internal resources of Germany became more and more exhausted, the pressure of the blockade became more and more heavy; it affected not only the military operations of the Germans, but ground down the morale of the civil population by privations and starvation. Germany could hold out only for a short period more, sufficient for one great attack to be made, and even this attack could not be made with its full effectiveness.

The second influence was the rapid and most effective preparation of the United States. In 1917 the United States had not been able to throw important military forces into the fighting lines. Naval forces had reinforced the Grand Fleet, and thus definitely prevented the Germans from ever again contesting the command of the North Sea with surface craft; other naval units had contributed to the gradual breaking up of the submarine offensive. But the principal contributions of the United States in this year were unlimited financial aid and indispensable morale encouragement. These were to play their part in meeting the first blows of the German 1918 offensive; the new American army, being rapidly formed and transported to Europe, was to contribute the

force which finally turned the scales and, in combination with the British and French Armies, to win the final decision.

During 1918 the German Navy still continued the offensive with the submarine weapon, with, however, constantly decreasing effect. The High Sea Fleet made a few raids into the North Sea, but generally limited its operations to a successful support of the submarines. When Hindenburg and Ludendorff, with supreme courage, threw all their reserves against the western front, it is difficult to see why the Germans did not use their battle cruisers, at least, on a raid into the Atlantic at the same time. Had they been able to prevent the sailing of American transports for even two weeks in the spring of 1918, the German Army might have won the war. Nevertheless, the fact that the High Sea Fleet was in being compelled Great Britain to retain 300,000 troops at home to guard against a German landing attack in England. In this way the High Sea Fleet contributed to the success of the great German attack on March 21, 1918.

In the last days of the war, when the German Army was hopelessly beaten, the commander-in-chief of the High Sea Fleet planned a submarine trap in the North Sea, similar to the operation of August 19, 1916. There was no chance that this would have resulted in any important success for the Germans. The mutiny of the German bluejackets, which prevented its execution, therefore had no material effect upon the war, notwithstanding the terrible disgrace it brought to the German Navy.

VI. SUMMARY OF THE EFFECTS AND RESULTS OF THE BATTLE

Having passed in review the course of the war after the battle of Jutland, we are now in a position to estimate its results. At the time of the battle two salient points of the strategical situation could have been recognized by the British and German leaders. These were:

(a) The Germans had a very little chance of winning a fleet action and any fleet action they might be able to win would not materially improve their strategical position, or have an important effect upon the naval campaign.

(b) The British had very favorable chances of winning a fleet action, and such a victory would improve very materially their

strategic position, and would have a decisive effect upon the naval campaign, if not upon the entire course of the war.

Therefore, it should be regarded as an extraordinary piece of good fortune for the British if a fleet action could be forced upon the Germans. This good fortune was further increased on the 31st of May by two factors which increased enormously the advantages of the British:

(a) The visibility conditions greatly favored the British, a fact which the British commander-in-chief states he knew at the time.

(b) The German fleet was on two separate occasions in the most extremely unfavorable tactical positions with reference to the British fleet.

A striking proof of these disadvantages of the Germans is demonstrated by the fact that the High Sea Fleet scored a total of two hits on the British Battle Fleet, inflicting five casualties.

Despite all the conditions in favor of the British, the Germans suffered far smaller material losses.

The moral results of the battle were favorable to the Germans throughout the world. The battle was a great blow at British naval prestige and tradition.

In judging the effects of the battle on the later course of the war, it is our opinion that the battle had no effect in favor of either the British or the Germans. It left the strategical situation as it found it.

After the action the pressure exerted by both the British and German Navies increased.

The blockade of the British Navy eventually helped to win the war in 1918, in conjunction with the Allied armies.

The German Navy came within an ace of winning the war with the submarine, assisted in the downfall of Russia, helped the defeat of Roumania, played its part in the rout of the Italian Army on the Isonzo, and gave the German Army a splendid chance to win on the western front.

We know the Allies won the war in 1918. But the present situation is only temporary. In ten years from now, who will be the real victor? Only the future can tell.

A victory in 1916 would have been a different victory than the victory in 1918.

VII. THE LESSON OF THE BATTLE OF JUTLAND FOR THE UNITED STATES NAVY

It would not be suitable for us to endeavor to point out the lessons of this naval battle, when this was done one hundred and thirty years ago by our first great naval commander, Paul Jones. Every American naval officer could do nothing better than to learn by heart the following remarkable statement:

> De Grasse had more ships, more men, and more guns than Graves had. His ships were better found and sailed faster, either ship for ship, or measuring the maneuvering power of the fleet by the slowest or dullest of all, than the ships of Graves. In my judgment, there has never been an occasion in all the naval wars between France and England when the opportunity was so distinctly and overwhelmingly on the side of France as in those few October days in 1781, off the Capes of the Chesapeake—when France actually had, for the moment, command of the sea. Now, my dear Kersaint, you know me too well to accuse me of self-vaunting. You will not consider me vain, in view of your knowledge of what happened in the past off Carrickfergus, off Flamboro Head, and off the Liman in the Black Sea, if I say that, had I stood—fortunately or unfortunately—in the shoes of de Grasse, *there would have been disaster to some one off the Capes of the Chesapeake;* disaster more lasting than an orderly retreat of a beaten fleet to a safe port. To put it a little more strongly, *there was a moment when the chance to destroy the enemy's fleet would have driven from me all thought of the conjoint strategy of the campaign as a whole.*

APPENDIX.

NEW INFORMATION CONCERNING THE BATTLE OF JUTLAND

On 31 March the writer sent ten questions to the German Admiralty concerning the battle of Jutland. On 9 June, the answers were supplied by Commander Groos, writing for Vice Admiral v. Mantey of the Naval Archives Section of the German Admiralty:

1. Q. How many German torpedo boats took part in the battle?
   A. Sixty-five German torpedo boats took part in the Skagerrack battle.
2. Q. How many were with Admiral Hipper?
   A. Of these, 32 torpedo boats were with Admiral Hipper.
3. Q. What was the total displacement of all the torpedo boats?
   A. Total displacement of torpedo boats—62,203 tons.
4. Q. What was the distance from Admiral Hipper's scouting line of light cruisers and torpedo boats to the *Lutzow* at 4.00 p. m., German time?
   A. Twenty nautical miles.

5. Q. About how many hits did the German battle cruisers receive before Admiral Scheer arrived, at about 6.45 German time?

A. The German battle cruisers received 11 hits (shell) and 1 torpedo hit up to 6.45 German time.

6. Q. How many hits did the German battle cruisers and the first division of battleships receive while pursuing Admiral Beatty to the northward from about 6.45 p. m. to about 8.00 p. m., German time?

A. About 15 hits. These are subject to correction and it is difficult to determine what part of the total hits should be attributed to the different phases of the engagement.

7. Q. When was the *Seydlitz* torpedoed?

A. *Seydlitz* was torpedoed 6.57 German time.

8. Q. Are the number of hits received by German ships, as given in my table on page 1767 of the enclosed pamphlet (The High Sea Fleet at Jutland) correct? If not, please inform me of errors.

A. The actual number of hits received is as follows:

Derfflinger, 28, of which 9 were of small caliber.
Seydlitz, 23, of which 2 were of small caliber
Moltke, 4, of which none were of small caliber.
Konig, 15, of which 5 were of small caliber.
Markgraf, 5.
Kaiser, 2.
Grosser Kurfurst, 9, of which 1 was of small caliber.
München, 5, all of small caliber.

The others correspond to the table.

9. Q. What were the exact losses of killed and wounded in the High Sea Fleet?

A. Losses among German crews in the battle:

Killed and missing	2545
Wounded	494

10. Q. How many German torpedo boats, in addition to those sunk, were damaged by gunfire?

A. Losses of German destroyers in the battle:

Sunk by gunfire	3
Sunk by torpedoes	2
Damaged by gunfire	6

NOTE: German time is two hours ahead of G. M. T., the time used in British accounts.

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THE ENGINEERING OFFICER-PERSONNEL PROBLEM

By COMMANDER W. S. MCCLINTIC, U. S. Navy

HISTORICAL SUMMARY

Engineering officer-personnel in the navy has existed under three distinct systems. First was the old engineer corps prior to 3 March, 1899. Under this system, the engineering officers formed a corps of their own and both operating engineers and those charged with the more expert work of design and construction were members of this corps. This system provided satisfactory engineers, but was the source of so much friction, jealousy, and lack of co-ordination and co-operation between the deck and engineer forces that it was abolished, and its members transferred to the line.

Next came the period of amalgamation. It was not absolute amalgamation, because there remained some officers of the old engineer corps who did not qualify for the general duties of the line and continued to perform engineering duty only, although they were actually transferred to the line by law. Under this system the operating engineers came both from regular line officers and from former members of the engineer corps. The designing engineers came principally from members of the former engineer corps. With the decrease in number of these officers, due to death, retirement and resignation, and also with the inclination of some of them to avoid engineering duty, there eventually arose a shortage of expert engineers for design and construction work. There was no shortage of operating engineers under this system. This was understood to be one of the duties of all line officers which they must be prepared to perform.

Under the amalgamation system, however, the shortage of experts became serious, and this led to the Act of 29 August,

1916, which contained a provision permitting the assignment of line officers to engineering duty only. This is the system under which we are now operating. Under this system, the major portion of operating engineers have to come from the regular line officers, while the necessary experts are supposed to be provided from those assigned to engineering duty only. The purpose of this section of the law was to provide expert designers, etc., and not to provide satisfactory operating engineers, who were already being supplied under the system in effect before the passage of this act.

It cannot be denied that this act has resulted in providing some experts, but how has it affected the supply of operating engineers, who have neither the talent to become experts, nor the inclination to limit their entire naval activities to engineering?

The following discussion is intended to show that, in attempting to cure one evil, this provision of the Act of 29 August, 1916, brought about a worse evil: *i. e.*, a scarcity of operating engineers. That this scarcity exists cannot be denied, and it is worrying not a few officers who have the welfare of the service at heart. With the large increase in the number of ships in the navy, especially of destroyers and submarines, the demand for operating engineers has assumed tremendous proportions. Those officers who have spent much time at sea within the past two years, will testify to the difficulties that have been encountered, not only in obtaining competent operating engineers, but in creating any enthusiasm or willingness among the younger officers to perform engineering duty or to receive engineering instruction.

ENGINEERING CONDITIONS BETWEEN 3 MARCH, 1899, AND 29 AUGUST, 1916

With the passage of the Act of 3 March, 1899, the officers who had formerly belonged to the engineer corps became line officers. Those who qualified for the general duties of the line performed both deck and engineering duty; those who did not qualify for the general duties of the line performed engineering duty only. While all officers of the old engineer corps were transferred to the line by this act, still certain ones, either through choice or otherwise, did not qualify for the general duties of the line, and consequently, in accordance with the same act, were restricted to the performance of such duty "as is per-

formed by engineers in the Navy." Needless to state, at the time of the passage of this act, such duty " as is performed by engineers in the Navy " was engineering duty and that duty only. This condition was theoretically, although not materially, changed by the Act of 30 June, 1914, as will be indicated later.

Therefore, subsequent to 3 March, 1899, and prior to 29 August, 1916, the navy had no officers whose entire time was devoted to engineering, except those members of the old engineer corps who did not qualify for the general duties of the line. A considerable number of the old engineers who qualified for the general duties of the line, did, of course, actually perform considerable engineering duty. With the passage of time, however, from the natural causes of death, retirement, resignation and promotion, there came a time when those who had qualified for the general duties of the line began to avoid engineering duty, for fear of being discriminated against in assignments to sea duty. Also, the remaining number of those who did not qualify for the general duties of the line became so small as to be insufficient to fill the requirements of the Bureau of Engineering for design, construction, installation, repair and inspection work.

The postgraduate course was started in 1909, and a small number of younger officers were given special courses in various branches of engineering. This should have proved an adequate measure if it had been started soon enough. There are inherent reasons why it must operate slowly. The course at the school is for two years. Upon graduation it is necessary for the graduates to acquire considerable practical experience, before they can be considered qualified as experts for design work, etc. Even then, only a part of them will qualify. Thus it necessarily takes several years before any considerable number can become available.

When the postgraduate school was started, the shortage of experts was already being felt, due to the natural decrease in the numbers of the old engineer corps who continued to perform engineering duty only. Before the output of experts, as a result of the establishment of the school, became appreciable, the shortage appeared serious. It does not seem unreasonable to suppose that if the postgraduate school had been started in 1899 instead of 1909, and thus had time to get into full operation, the flow of experts would have started soon enough and been sufficient to fill all actual

requirements and the conditions would not have arisen which brought about the passage of that section of the Act of 29 August, 1916, which provides for the assignment of line officers to engineering duty only.

In casting about for a more speedy remedy than the postgraduate school, for what was considered to be a serious situation, the pendulum swung back toward a separate corps. It did not swing all the way back to its position prior to 1899, but approached that position.

ANALYSIS OF THE ACT OF 29 AUGUST, 1916, AS IT AFFECTS ENGINEERING PERSONNEL

The Naval Appropriation Act of 29 August, 1916, contained the following provision:

> Officers of the line of the Navy not below the grade of lieutenant may, upon application, and with the approval of the Secretary of the Navy, be assigned to engineering duty only, and that when so assigned and until they reach the grade of commander, they shall perform duty as prescribed in section four of the Personnel Act approved March third, eighteen hundred and ninety-nine, and thereafter shore duty only as now prescribed for officers transferred to the line from the former engineer corps, except that commanders may be assigned to duty as fleet and squadron engineers: Provided, That when so assigned they shall retain their places with respect to other line officers in the grades they now or may hereafter occupy, and also the right to succession to command on shore in accordance with their seniority, and shall be promoted as vacancies occur subject to physical examination and to such examination in engineering as the Secretary of the Navy may prescribe: Provided further, That the number of officers so assigned in any one year shall be in accordance with the requirements of the service, as determined by the Secretary of the Navy. . . . .

It is my understanding and belief that the primary purpose of the framers of this law and of the Congress which passed it was to create a group of officers in the higher grades, limited in number, who would be especially well qualified in engineering knowledge and who could perform duty as designers, builders and inspectors of engineering material. Officers who could satisfactorily perform this duty have to possess engineering knowledge superior, or at least in addition, to that required of an operating engineer and this law was framed with the purpose of permitting officers to acquire this knowledge. It was not the purpose of

the law to provide a large number of operating engineers at sea, although, of course it was not intended to prevent this. Presumably, the law was not intended to discriminate against any class of officers or to grant any unnecessary privileges to any group of officers.

Let us analyze the provisions of the law, however, and see what has been and what will be the consequences of these provisions.

First, let us take the only qualification required of a candidate. An officer "of the line of the navy not below the grade of lieutenant may, upon application, and with the approval of the Secretary of the Navy, be assigned. . . . ." No severe qualifications required here. No examination, no exceptional knowledge of engineering required to be demonstrated; no qualification for the general duties of the line other than that he shall have attained the rank of lieutenant! All that is necessary is to attain the rank of lieutenant in the line, make application, receive the approval of the Secretary of the Navy, and become an expert engineer for life! Unless very carefully guarded against, it seems inevitable that sooner or later, practically all applicants are going to be from those officers who have just reached the grade of lieutenant. An ensign, upon graduation from the Naval Academy, is going to make up his mind pretty soon whether or not he will apply for this duty. If he decides to apply, is it not natural for him to use every effort within his power to perform engineering duty while in the grade of ensign and lieutenant junior grade, simply because this will best fit him for his future work? Upon reaching the grade of lieutenant he applies. If his first application is not approved, he will probably not again apply. If his application is approved, to all intents and purposes, forever thereafter he performs engineering duty only. Where and when will he acquire the experience which will fit him for or impress upon him the necessity for that close cooperation between all departments which is required? The answer is that he will not get it, except insofar as his duties during his career as ensign and lieutenant (j. g.) have been such as to inculcate it. Unless the law is administered in such a way that future assignments to this duty come from officers of the grade of lieutenant commander and above, preferably above, this group of officers will eventually consist of officers who have practically no knowledge of the general duties of the line, and will become very closely akin to the old engineer corps.

The above criticism does not apply to a large percentage of the officers now composing the group. Upon the passage of the act of 1916, the first assignments to this group, under the act, were not all drawn from those who had just become lieutenants, but were selected from officers who had been performing the general duties of the line for a number of years. The result is that a large proportion of them have the necessary qualifications for performing the general duties of the line, and do appreciate the necessity for the close cooperation and team work required between the deck and engineer departments. As indicated above, however, it is believed that this condition will soon cease to exist, and the majority of the officers in this group will not be so qualified.

Omitting for the moment the next provision of the law about the kind of duty these officers shall perform at sea, it is next noted that after reaching the grade of commander they shall perform "shore duty only as now prescribed for officers transferred to the line from the former engineer corps, except that commanders may be assigned to duty as fleet and squadron engineers." Presumably, this provision was for the purpose of permitting the Bureau of Engineering (Steam Engineering at that time) to obtain the fullest use of the services of these officers for design, construction, installation, repair and inspection work in the shore establishments, and also because it was not deemed proper to send them to sea as engineer officers of ships after they had reached the grade of commander. Presumably also, it was the intention to limit their shore duty to some form of engineering duty, but a study of other laws shows that the wording of this law does not accomplish this.

In interpreting the above provision, and specifically that part of it which reads "shore duty only as now prescribed for officers transferred to the line from the former engineer corps," it must be remembered that officers transferred to the line from the former engineer corps consisted of two classes: first, those who qualified for the general duties of the line, and were, therefore, eligible for any duty at sea or on shore; and secondly, those who did not qualify for the general duties of the line, and were, by the Act of 3 March, 1899, eligible only for engineering duty, whether at sea or on shore. This in itself is sufficient to show that the above quoted provision of the law does not, with certainty, accomplish what presumably was intended, because part of the old engineers were eligible for any kind of duty. But, to go still further, refer to

the Act of 30 June, 1914, passed over two years before the Act of 29 August, 1916. We find in the Act of 30 June, 1914, the following provision:

> That officers who now perform engineering duty on shore only . . . . shall be eligible for any shore duty compatible with their rank and grade to which the Secretary of the Navy may assign them.

This, then, made those officers who, under the Act of 3 March, 1899, did not qualify for the general duties of the line, eligible for any duty whatever on shore, within the discretion of the Secretary of the Navy; and completely wiped out all restrictions of law on the kind of duty which former officers of the engineer corps could perform on shore. It, in effect, repealed Section 5 of the Act of 3 March, 1899, which was the section that provided that those officers of the old engineer corps who did not qualify for the general duties of the line, should perform engineering duty only, on shore only, after reaching the grade of commander. Therefore, when the Act of 29 August, 1916, was passed, the provision about the kind of duty which officers assigned to engineering duty only under the act should perform on shore meant nothing whatever. There were no restrictions before, and legally there are none now. Under the law they are eligible for any duty on shore. The requirements of Article 163, Navy Regulations, 1920, is not law. The implication in this article of the Regulations that the Act of 29 August, 1916, required them to perform engineering duty only, when on shore, is misleading and incorrect. The article may have the force of a regulation but it is not law.

While the above conclusion seems to be incontrovertible, yet it is believed to be true that the general impression is that officers assigned to engineering duty only are eligible for engineering duty only, when on shore. Certainly, it has been the custom in the past to so assign them, unless an assignment as industrial manager of a navy yard is considered to be an exception.[1] In fact, Article 163 of Navy Regulations, 1920, requires it. Assuming that they are so assigned, what will be the result? Sooner or later every desirable engineering shore billet will be filled by these officers who cannot be sent to sea.

The inevitable consequence of this condition will be that the young officer will, whenever possible, avoid engineering at sea

[1] This article was written before the present head of the Post Graduate School was ordered to that duty.

unless he expects to apply for engineering only, because, when it comes time for him to go on shore, he knows that he cannot get any shore job for which engineering at sea will have fitted him. This condition exists now to a certain extent, and it is going to become harder and harder to obtain willing operating engineers at sea, except those who intend to apply for engineering duty only.

Another unfortunate feature of this understanding of this provision is that some officers may be under the suspicion of having applied for engineering duty only primarily because they prefer to live on shore. This, of course, is a perfectly natural preference, and it is conceivable that an officer's inclination and willingness to perform engineering duty may be largely influenced by it, but it will not necessarily produce expert engineers.

The third provision is " that when so assigned they shall retain their place with respect to other line officers in the grade they now or may hereafter occupy." Thus, they are not removed from the line and made into a separate corps. They remain line officers, in name, and their commissions read like any line officer's. There is no criticism of the intent of this provision, except insofar as it may be inconsistent with the requirements of other provisions of the law. Is it a good thing to give an officer a commission which is identical in wording with the commission of any line officer and then limit the duty and authority which can be performed under that commission? Insofar as this provision attempted to avoid the formation of another corps, its motive was good; but bad laws sometimes spring from good intentions—the essential thing is to get inherently good laws which, in operation, will work for the good of the service.

The fourth provision of this section of the Act of 29 August, 1916, is that officers assigned to engineering duty only shall retain " also the right to succession to command on shore in accordance with their seniority." No loss of prestige here. Insofar as the exercise of command on shore is concerned, the law makes no change whatever in the status of line officers assigned to engineering duty only. As stated above, under the discussion of the second provision, the law does not require that the shore duty performed by these officers be confined to engineering duty. They are eligible, insofar as the law is concerned, for the position of Chief of Naval Operations, Superintendent of the Naval Academy,

President of the Naval War College, or any other important military and administrative assignment.

The fifth provision is that they "shall be promoted as vacancies occur, subject to physical examination, and to such examination *in engineering* as the Secretary of the Navy may prescribe." It should be noted that their professional examination for promotion is limited absolutely to engineering.[2] Although, by the fourth provision above noted, they still retain their right to command on shore, yet, at no time after being assigned to engineering duty only, are they ever required to show, by examination, that they possess the slightest knowledge of even the first principles of the art of command, navy regulations, military law, naval customs or discipline. The recommendation of the selection board on their cases "shall be based on their comparative fitness for the duties prescribed for them by law," whatever that means. Upon promotion they become extra numbers in their grade.

The sixth provision is "that the number of officers so assigned in any one year shall be in accordance with the requirements of the service as determined by the Secretary of the Navy." This is a very elastic limitation. Who knows how many are going to be added this year or next? Much depends upon the personality of the Chief of the Bureau of Engineering, on his view of the situation, and on his ability to convince the Secretary of the soundness of his views. A glance at the Navy Register of 1 January, 1920, the latest one available, shows that at that time there were 63 line officers assigned to engineering duty only, in addition to 13 members of the old engineer corps who did not qualify for the general duties of the line. The numbers in all other branches, both line and staff, are regulated by law. Why not this one? The larger the number assigned to this duty, the greater will be the tendency to look upon engineering as a thing apart from the duties of regular line officers; the less will be the inclination of unrestricted line officers to seek engineering duty or instruction, and the greater will be the reluctance of commanding officers to assign them to such duty. Certainly the need for expert engineers for design, construction, installation, repair and inspection work, can be de-

[2] General Order No. 49 has been issued since this article was written. In the opinion of the author, that part of General Order No. 49 which requires that engineering only officers be examined professionally on other than engineering subjects, is illegal and cannot be sustained.

termined within reasonable limits. Having been determined, no more than this number should be assigned to this duty. This provision, without any limitations as it now stands, is pernicious and capable of maladministration.

Referring back now to a point temporarily passed over in the early part of this discussion, we shall take up the subject of the kind of duty which these officers can perform at sea. For convenience, we will call this the seventh provision of the law, although it comes second in the actual wording. It is "that when so assigned (to engineering duty only) and until they reach the grade of commander, they shall perform duty as prescribed in section four of the Personnel Act approved March third, eighteen hundred and ninety-nine . . . . except that commanders may be assigned to duty as fleet and squadron engineers." The parenthetical entry is mine.

For convenience, section four of the Act of 3 March, 1899, is quoted:

SEC. 4. That engineer officers transferred to the line who are below the rank of commander, and extending down to, but not including, the first engineer who entered the Naval Academy as cadet midshipman, shall perform sea or shore duty, and such duty shall be such as is performed by engineers in the navy; Provided that any officer described in this section may, upon his own application, made within six months after the passage of this act, be assigned to the general duties of the line, if he passes the examination now provided by law as preliminary to promotion to the grade he then holds, failure to pass not to displace such officer from the list of officers for sea or shore duty such as is performed by engineers in the navy.

It is believed that this seventh provision of the law is the cause of more dissatisfaction with it than any other. The other provisions have been mentioned simply to point out their merits or evident defects. Their defects can probably be remedied; by legislation, if need be. But this provision, which governs the privileges which these officers enjoy and the restrictions to which they are subjected, while serving at sea, is not capable of such a satisfactory solution.

It is not clear to some officers of the service whether or not officers "assigned to engineering duty only" in accordance with the Act of 29 August, 1916, are eligible under the law to succeed to command afloat; and whether or not, when on duty as head of the engineering department on board ship, they are eligible to stand day's duty, as required by regulations in the case of the other

heads of departments. As a matter of fact, the two duties require the same eligibility, because, if they are eligible to stand day's duty, when all seniors leave the ship they must be eligible to command. Otherwise the acting executive would be senior to the commanding officer—an absurdity. The question of eligibility is somewhat complicated by the unfortunate wording of Article 1003 (6) of the Navy Regulations, 1913, reprinted, without change of intent, as Article 150 (7) of the Navy Regulations, 1920.

Personally, I can see only one interpretation in accordance with the laws above quoted, and that is that an officer " assigned to engineering duty only " in accordance with the Act of 29 August, 1916, is not eligible at sea to succeed to command, to stand day's duty or, in fact, to exercise any authority whatever, outside of his own department. In my opinion, an ensign of the line, not assigned to engineering duty only, would exercise command over any officer so assigned when afloat. Any other procedure would appear to be illegal.

In reply to a request from the Commander-in-Chief, Atlantic Fleet, for an interpretation of Article 1003 (6), Navy Regulations, 1913, the Judge Advocate General rendered an opinion which was approved by the Secretary of the Navy on 29 May, 1920, and which may be read in full in Court Martial Order No. 76, 1920 of 31 May, 1920.

The following is quoted from the Judge Advocate General's opinion:

> As above indicated, it would be clearly inconsistent with law to authorize a line officer who is restricted by law to the performance of engineering duties only to exercise military command afloat. . . . .

Article 1729 (4) Navy Regulations, 1920, is to the same effect, and, indeed, is probably based on the Judge Advocate General's opinion.

Notwithstanding the above opinion and regulations, however, there are officers who believe the opposite to be the true interpretation of the law; and I understand that there is at least one battleship in the Atlantic Fleet upon which the engineer officer, who is an officer " assigned to engineering duty only," rotates with the other heads of departments on day's duty.[1] What would happen, and who would be held responsible, in case of disaster, while

[1] April, 1921.

this officer were acting as temporary commanding officer, would be an interesting legal question.

Entirely aside from the legality of the procedure, however, is the question of its *desirability*. Let us assume, first, that the present opinion of the Judge Advocate General and the provisions of the Navy Regulations will govern, and let us analyze the resulting situation.

First.—The "engineering only" officers, being interested primarily in engineering, and being limited absolutely in their duties to the engineering department, will become more and more absorbed in that particular feature of the ship, at the cost of their interest and enthusiasm for the ship as a whole. Cooperation, teamwork and ship's spirit will suffer.

Second.—The "engineering only" officers will often find themselves subject to the orders of their juniors in rank, and frequently to their inferiors in ability. It may be argued that these officers should appreciate this possibility before they apply for the assignment. True enough, but this will not soothe the feelings of some of them under the above conditions. This has already been the cause of some officers regretting that they ever applied for, or were assigned to, this duty. The desire to command is inherent, and is not lightly put aside. One cannot foresee all the possibilities of the future. Ill feeling will result, and the drifting apart mentioned above will be accelerated.

Third.—On no ship will the other heads of departments desire to have an "engineering only" officer as engineer officer, because this will require the other heads of departments to stand all the day's duty. In other words, it works against the popularity of this class of officers, and engenders a spirit of class distinction and discrimination which is exceedingly detrimental to a united service.

Now let us assume that the "engineering only" officers are not restricted in their right to command at sea, or that, if they are, the restriction could be removed by legislation. The following would appear to be reasonable deductions, if such conditions existed:

First.—Within a few years we would have officers succeeding to command at sea who are in no sense qualified to do so. It is undoubtedly true that a large percentage of the officers assigned at the present time to engineering duty only are officers who have had sufficient general training to qualify them for the performance of the general duties of the line and for exercising command.

Still, the law is such that this condition will probably not continue. The law makes the rank of lieutenant the lowest rank eligible for assignment to engineering duty only. As a matter of fact, a large proportion of those who have been assigned, have been of a rank higher than lieutenant so that, undoubtedly, for the present, most of them have had the experience which qualifies them for the exercise of the general duties of the line. This condition was brought about by the fact that prior to 29 August, 1916, there was no such thing as "engineering duty only" except for certain officers of the old engineer corps; and, with the passage of the act, the first increments to this group came largely from officers who had had considerable all round general duty. These are the officers whom we have at sea now. It seems that, of necessity, this condition will rapidly change with the promotion of the officers who are now in the lieutenant commander's grade. Looking into the future, will it not necessarily be true that, with the law on the statute books and well understood by everybody, the future additions to this organization will be composed largely of younger officers who have just reached the grade of lieutenant? These younger officers will make up their minds early in their careers that they will apply for assignment to engineering duty only and, consequently, so far as lies within their power, will perform the duty which will best qualify them for the performance of their special duty, after they are assigned to engineering duty only. If this is the case, it certainly seems reasonable that the average officer of the future, who is assigned to engineering duty only, will not have had the experience necessary to qualify him for the general duties of the line, or for exercising command at sea. As above stated, they are not examined for promotion on anything except engineering subjects. The result under this second assumed interpretation of the law, therefore, would be that, within a few years, we should have officers succeeding to command who are in no sense qualified to do so; and it would then be necessary, but extremely difficult, to reverse the policy.

Second.—They already retain their right to command on shore; they choose the duty which they are to perform; they are examined for promotion, only in engineering; upon reaching the grade of commander they perform shore duty only, and thus occupy practically all the desirable engineering shore billets. If they should also be given the right to exercise command afloat—the inherent

right of the unrestricted line officer—they would become a privileged class, indeed.

It seems apparent, therefore, that no matter which interpretation is placed upon this seventh provision of the law, it is not going to work for the best interests of the service.

CONCLUSIONS

It is evident from the foregoing study, that the provisions of law which authorize the assignment of officers to engineering duty only were loosely drawn, and that they do not accomplish what was evidently intended and desired.

It was intended and desired to avoid friction, jealousy and lack of cooperation between the deck and engineering forces. The law has fostered these to a large degree.

It was intended and desired to avoid discrimination against or humiliation of anyone. The law so works as frequently to incur both.

It was intended and desired to avoid the formation of any "close organization" or "special privilege" group. The law has created the latter to an unusual degree.

It was intended and desired to limit those officers assigned to engineering duty only, and who had reached the grade of commander, to the performance of engineering duty only, on shore only. The law does not impose any restriction whatsoever on the duty which they perform on shore.

It was intended and desired to provide a limited number of expert engineers in the higher grades, for design work, etc. The law has accomplished this at the cost of enthusiasm or willingness on the part of the younger line officers to perform engineering duty at sea, with the inevitable result that the navy is lamentably short of skilled operating engineers.

SOLUTION

With the provisions of the Act of 29 August, 1916, in effect, the navy is not getting the required number of skilled operating engineers. *These are the navy's greatest engineering need at the present time.*

The primary purpose of this paper is to invite service attention to the subject, and to point out as clearly as possible the peculiar

requirements of the Act of 29 August, 1916. To many, there will appear to be one obvious solution, but the subject must be considered from all angles. It is only by thought and discussion in the service, that a satisfactory solution of the problems confronting it will be arrived at. The following points are submitted, therefore, as a basis for discussion; and should be considered in seeking a satisfactory solution of the problem of obtaining and maintaining an efficient engineering personnel, whose primary thought will be "the good of the service":

(a) The requirements of the service for operating engineers have got to be met by the average line officer not restricted to engineering duty only. If this is not the case, and the operating needs are to be met by wholesale appointments to the engineering only group, then we, in effect, revert to the old engineer corps, already tried and found wanting.

(b) Real amalgamation will remove all causes of friction, jealousy, hurt pride, or special privilege which are fostered under the present law, between those officers of the line who are restricted to engineering duty only and those who are not.

(c) Real amalgamation will impress upon line officers the necessity for looking upon engineering as a part of their regular duties which they must be prepared to perform.

(d) If enthusiasm for or willingness to perform engineering duty can be created among the younger line officers, the problem of providing sufficient operating engineers will take care of itself. Of course, there must be a realization on the part of commanding officers that a fair proportion of the officers on board must be assigned to the engineering department. It is folly to expect that the engineering department can be run efficiently if other departments have all the choice in the assignment of officers. If the engineering department is discriminated against, either in numbers or quality of officers assigned, it can reasonably be expected that poor results will be obtained. The percentage of officers assigned should be based on the stations to be manned in action, on the routine work required for upkeep and division duty, and on the necessity for a reasonable number standing watch. On first class ships it would seem that a watch in four is the lowest which should be required in the engineering department.

(e) Real amalgamation, *especially with the aid of postgraduate courses,* will always provide a certain number of officers who are

better qualified along particular lines than the average officer. Those officers particularly qualified in engineering should be the ones assigned for design, construction, installation, repair and inspection work in engineering where the duty is beyond the capacity of the average officer. This method is followed, either with or without postgraduate courses, in all other branches of line activity, notably in ordnance and navigation.

(f) Real amalgamation will impose a certain limit on the complexity of the machinery design, in that it must be operable by the average officer. The designer, being himself a seagoing officer, will appreciate the necessity for simplicity and ruggedness of design.

It would appear that the repeal of that section of the Act of 29 August, 1916, which provides for the assignment of line officers to engineering duty only, and the consequent return of all line officers to the performance of the general duties of the line, should be the first steps towards solving the problem. Whether or not there is any middle course is open to discussion, but the disadvantages of forming a special group should be carefully considered. At any rate, it must be remembered that all line officers of equal rank, at sea, should be in exactly the same status as regards the exercise of authority and the enjoyment of privileges.

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DISCIPLINE[1]

By CAPTAIN E. B. FENNER, U. S. Navy

In the consideration of abstractions it is of first importance to get clearly before our minds a definite idea of the subject under discussion, consequently it is well, first, to find out what discipline is. After all the talk on this subject for the past six years, and particularly to naval officers, such an inquiry may appear pedantic; but it is more than likely that, if each of you were to write out a definition of discipline, no two would exactly agree and many would differ fundamentally.

Suppose we start with what seems to be a very wide spread popular notion of the meaning of discipline, as gleaned from articles in the public press of the whole country, from very yellow dailies to very blue weeklies and monthlies. I have read scores of such articles, and from them would construct a definition somewhat as follows: Military discipline consists in the giving of unnecessary orders in the most irritating way possible by totally incompetent individuals who have obtained in some underhanded manner the legal right to wear an officer's uniform. It is silly of course, and the mere existence of our army and navy through voluntary enlistments for over a hundred years should prove its folly; doubtless does so prove it to people who think. Boys from 17 to 20, however, have never been noted for careful and logical thinking, so that the sort of propaganda against military discipline that is embodied in my popular definition falls upon more or less fertile ground both among men already in the service and in those who contemplate enlisting.

Another more insidious form of anti-military propaganda preaches that military life requires a harsh and brutal discipline

[1] A lecture delivered before officers at Mare Island Navy Yard, October, 1920.

and consequently that harshness and arrogance in military officers are to be expected—in fact are necessary. If such an impression be wide spread, and apparently it was and is, then upon the vast expansion of our military forces made necessary by actual war, many of the young men from civil life, made officers overnight, will conscientiously try to be "hard boiled"; and thousands of other young men, serving as recruits under them and having practically no contact with the small nucleus of trained regular officers, will leave the service more than ever convinced of the correctness of their preconceived ideas, thus completing the vicious circle of error. From what I have read about our vast national army, when only one officer in forty was a regular, I am convinced that much, if not most, of the disciplinary friction was the direct result of a thoroughly well-intentioned effort on the part of young civilians in uniform to live up to the story book type of bucko mate that, if it ever did exist in the regular services, has been deader than Pharaoh for more years than my knowledge of the service covers. The converse of this trouble was observable among other equally conscientious young men who had made up their minds that, come what might, they would not become arrogant militarists and who, to carry out their determination, never gave an order without apologizing for it.

It is on this account that such ideas, however silly, become important and it rests primarily with the officers of the regular service, so to understand and teach the true meaning of discipline, that such erroneous notions shall die.

There are many other false ideas of discipline, but perhaps we have spent enough time on what it isn't and would better progress to what it is. We naturally turn first to the dictionary, but dictionaries record usage and usage varies as may be seen from a list of synonyms of discipline taken from Webster: instruction, training, culture, correction, chastisement, punishment. Obviously, if these are all proper synonyms for discipline, it must be a very chameleon of a word. One of the best dictionary definitions is as follows: "Discipline; severe and systematic training, especially with a view to right conduct or prompt and effective action." In general, it is safe to say that the one underlying idea of the varying synonyms and definitions of the dictionaries is that of the control of individual instinct or desire by some kind of authority. The variations in usage result from differing ideas as

to the means of attaining such control and these means of attainment divide themselves into three broad classes, material, mental, and moral, so that we have the discipline of law or force, with material reward, usually money, for well doing; the discipline of public opinion, with the applause of the community as a reward; and the discipline of conscience, with self respect as a reward. Each of us is under the influence of one or all of these compulsions in practically every act of a civilized existence; without such discipline civilization would cease to exist and men would become beasts.

The more thoughtless, ignorant or brutalized a man is, the more the law's "you must," with punishment in the background and dollars in the foreground, are necessary to insure right conduct and strong effort; but there are very few of us who never need it. Would the sign board along the road saying "Reduce speed to 15 miles" invariably be respected if there were no fear of speed traps and subsequent penalties? Which would produce more teachers, the offer of $10,000 a year salaries or the desire to do good?

With the average man, public opinion when definitely and strongly expressed, is probably the strongest incentive to well-doing or at any rate to doing the thing that public opinion approves. Every decent man despises a thief, and probably this universal feeling has more to do with keeping down thievery than fear of a definite punishment. Sometimes, often in fact, public opinion is strongest on customs whose violation involves no moral turpitude whatever. Which of you would walk up Fifth Avenue with a beaded bag in one hand and a pretty pink parasol in the other? There would be no harm in it, but public opinion demands a certain uniform for men which may be varied a good bit, but never beyond the limits laid down. Why do men like to see D. D., or LL. D., after their names? Because it means that some recognized body has considered them worthy of honor and public opinion gives a value to the symbols.

Last of all and by far the finest and most efficient instrument of discipline for high-grade men is that which comes from within. We may call the impelling motive conscience or honor or self-respect or a sense of duty or a dozen other names but, whatever we call the motive, it is that which drives upright men along the strait path with greater force than all the external compulsions

of the world, the flesh and the devil. For men in whom this internal urge is strong, there is no greater reward than the satisfaction of a job well done.

To recapitulate, we have three lines of operation in inculcating discipline, six if we take both negative and positive sides of each; physical punishment and material reward; popular praise and popular censure; conscience and self-respect.

So far we have considered discipline in general as applied to everyone, now it is time to specialize on military discipline and to look into the reasons for the aversion to it so commonly met with. Partly, even largely, this aversion is due to the total lack of comprehension of the subject already dwelt upon; which, to a great extent, must always exist in a thoroughly non-military nation like our own. Partly, also, it is due to a dislike of all restraint which is very noticeable among our individualistic fellow-countrymen. Partly, however, it must result from differences in the civil and military methods of applying that "training for right conduct or for prompt and effective action" which, as an end, must be approved by all reasonable people. Do these differences in method exist; what are they; are they unavoidable? To answer these questions we must look into the six disciplinary compulsions I have mentioned and see to what extent each one applies both in civil and in military life.

MATERIAL REWARD AND PUNISHMENT

Most material things can be bought for money, so that material reward and money reward are practically synonymous. Under present conditions we certainly can offer a good living to all men who will make the navy their life work and by judicious promotion can keep the financial factor always a real incentive for good work. You will, however, all agree that no naval officer or man who devotes his effort single-heartedly to his profession can ever attain wealth, so that the glitter and lure of great possessions, one of the mightiest driving forces in civil life, is totally lost to us. Few men ever attain wealth, but fewer still, in all probability, fail to see it ahead in their young day-dreams.

Punishment, on the other hand, is always available in a military service. It must be used to a considerable extent in controlling a crowd of irresponsible youngsters, full of ginger and, very prob-

ably, away from home restraints for the first time in their lives. Punishment is simple, often it is effective and always it is easier to apply in military than in civil life.

POPULAR PRAISE AND POPULAR CENSURE

Popular opinion in matters of morals and conduct is a plant of slow growth. It isn't always right or reasonable, but usually it directs the people along those paths that years, generations and even centuries of experience have found to lead to success for the individual and comfort for the community. The one essential to sound and valuable public opinion, however, is a thorough understanding of the conditions under which people have lived and worked, not for a day or a year, but for many years. "Honesty is the best policy" is a bit of crystallized public opinion that would never have been formulated from a few observations; the temporarily successful rascals are too numerous and too conspicuous. Long continued observation, however, shows the general truth of the proverb. Again, public opinion is most effective when the individual realizes that he and his connections are well known and that his acts are observed closely by that portion of the public whose opinion decides his standing in the community. A young man, or an old one, in his home town is far more careful of his conduct than he would be in some distant city or foreign country where public opinion ignores his existence as an individual.

Popular praise usually sees only the actor in the spotlight of wealth or of newspaper fame. In time of war the soldier or sailor has the front page; he is a person of first importance to the community and, on the whole, the disciplinary effect is good so long as the interest lasts, although there is too much emotionalism in this interest to make for steady development. In time of peace there is practically no public interest in the service men and, in war or peace, there is never in this country an intelligent public opinion on military affairs based on a thorough understanding of the aims and needs of the services. Indeed, such an intelligent public opinion on military life and training as exists on civil affairs is an impossibility anywhere. The man in business decides on a plan of operations, tries it out next week in full view of his neighbors, fails or succeeds; and his experience immediately adds so much fairly accurate knowledge to the foundation on which in-

telligent public opinion is built. The military man decides on a plan of operations and then, so far as actual experiment is concerned, he waits for the next war which may occur in his lifetime, more probably in that of his son. If the plan continues to live in the minds of a few specialists it is the best that can be hoped for and its success or failure will be merely one isolated military fact so far as the public consciousness is concerned, without any known connection of cause and effect.

It seems then that military discipline has little hope of assistance from public opinion either in the way of censure or praise except in time of war. Since, fortunately, the peaceful years of our country so much exceed in number the warlike ones and since our disciplinary work of preparing for war must nearly all be done, if we are to succeed, before war comes, we must regretfully give up public opinion as an aid to military discipline except in so far as we can create a public opinion within the service, which is entirely possible with fairly long enlistments, but desperately difficult when we keep the men only a year or two. It may be said in passing that, one of the chief functions of the Naval Academy and of our training stations is to make a start in the creation of this service public opinion.

CONSCIENCE AND SELF-RESPECT

As the internal compulsion of conscience is by far the loftiest of all impelling motives toward upright conduct, so, also, is it the slowest of growth. If conscience began to develop only after entry into the service we should have a hopeless task in our training. Fortunately, however, most fundamental military virtues are universally recognized as virtues without the military prefix and we can benefit by every bit of moral training a young man has received before enlistment, provided the special needs and aims of military life are properly presented to his intelligence, and provided again that a reasonable degree of intelligence exists, which it does with 90 per cent of our men. The very lack of material reward as an incentive to well-doing may be of assistance in the development of sense of duty, for in the pursuit of financial success dollars are apt to obscure the light of conscience. Again, in a service where financial competition is wiped out, we are apt to get a clearer view of the intrinsic merits of the job itself; and we know that when we do a good piece of work people, in the service

at any rate, won't look wise and wonder how much we got out of it. This certainly makes for self-respect; in fact it may make for excessive self-respect and is doubtless responsible for many of the accusations of snobbery against military men.

It would appear then that conscience and self-respect are at least as powerful motives in the service as out of it, perhaps more powerful, always provided we make the effort and have the time to adapt general moral training to the specific needs of a military life.

From this rather hasty survey of the disciplinary means at our disposal it is evident that punishment, conscience and self-respect, all of them the more austere driving forces, are readily available in a military life; while material reward, public praise and public censure, the more emotional and usually the less distasteful types of moral compulsion, are comparatively lacking. This situation, I believe, is the basic reason, and a genuine reason, why people in civil life, and a good many in military life as well, dread and dislike military discipline. Add to such a feeling the mistaken idea that punishment is our *only* means of procuring "right conduct or prompt and effective action," which mistaken idea is much fostered by the use of the word disciplinary when punitive is meant as in "disciplinary measures," disciplinary barracks," etc., and it is no wonder that discipline has a very bleak sound in most ears. If we can get rid of this last positively false notion, the necessary austerity of military discipline will frighten no one who understands it.

So far we have discussed the nature of discipline and of the means to its acquirement; now a few words must be said on the mental and moral conditions we are trying to establish by the use of these disciplinary tools, and something as to the concrete methods of applying our theories of discipline. Doubtless there are many valuable by-products obtainable from a military training, such as respect for authority, patriotism, knowledge of various trades and so on. The one logical reason for the existence of an American Navy, however, is that our government may be protected from forcible outside interference in the elaboration and execution of its policies; in other words, the navy is a war engine pure and simple and we succeed or fail as officers in direct proportion as our engine functions or fails to function under the

war conditions; that is, under conditions of physical hardship, mental excitement and moral disruption conducive to emotional insanity. Our pacifist friends often point to the state of society during and after a war as evidence of the evils of military training. They say military training precedes war, demoralization follows it, therefore military training produces demoralization; as well say that sanitary measures precede epidemics and death follows, therefore sanitary measures produce disease and death. Military discipline aims so to teach control of man's natural instincts that pain, fear, excitement and every other disruptive emotion will glance off his moral trench helmet and leave him still a reasonable human being ready to act intelligently whether on orders from without or initiative from within. Naturally, with most men, this is an ideal impossible of attainment, but it has been attained by some great military characters and every step by which we approach it is a step toward our goal.

The various forms and conventions of military life have been devised through 50 centuries of study by the greatest minds the world has produced for the production of this moral result and may fairly be presumed to be good if not the best measures for the production of the desired result. At any rate, a discussion of naval and military laws and regulations is too broad to go into now and we must confine ourselves to a consideration of the best means of bringing non-military young men into a state of mind which accepts contentedly and intelligently the kind of life that is governed by those laws and regulations.

It will be well, perhaps, to keep to our original classification of means and to start with:

PUNISHMENT

It goes without saying that, to be effective, punishment must be just, but that isn't enough; the man being punished must recognize the justice of the punishment if it is to be of real corrective value. It takes time and patience to explain without undue preaching the why of every report, but the officer who does so will find that he has fewer and fewer reports to make. It will be found that at least nine-tenths of the cases that come to the mast are the result of infractions of regulations that were made for the protection and well-being of the men themselves. If a man

overstays his liberty some one else must do his work; if he fails to look out for his clothes, he is apt to lose them, or some one else must pick up after him, perhaps some one else will be suspected of theft; if, as a cook, he fails to keep things clean, or to prepare food properly his shipmates suffer. A hermit living in the midst of a wilderness can do about as he pleases and no one would care, but in a military life, and particularly in the navy, we live so close together that every act is bound to affect our shipmates and it takes a great many rules on apparently petty subjects to prevent the friction that results from such crowded conditions. A boy on the farm if he feels grouchy can go out in the woods until he gets over it; on board ship he must stick it out in the crowd and until he is able to exercise self-restraint, the restraint must be applied from outside if other people are to have any peace and quiet at all. All these things are obvious enough, but men don't stop to think of them and an officer can do much by bringing up such subjects before his division. Keep this need for added consideration and courtesy on account of crowding before men's minds; remember it yourselves when some one shows a burst of temper, very possibly due to crowd irritations, and many a punishment will be made corrective if not rendered altogether unnecessary.

Another very common class of offenses that brings men to the mast is a failure to recognize the government's property rights. Men waste food, break up gear, lose their identification tags and so on. Each individual loss seems trivial and the government is rich, but if you impress upon the waster what would be the loss when multiplied by a hundred thousand, he will be well on the way toward reformation and the punishment assigned will be recognized as just.

I do not hold the theory that punishment should be kept for wilful evildoers exclusively. Some people will continue to be careless until they find that the results of carelessness in the shape of punishment are more unpleasant than the necessity for taking thought. The one idea that should be impressed on every person in the naval service, however, is that punishment is assigned for the correction of the individual and still more for the protection of the community; never for revenge nor from caprice. If that idea is thoroughly believed by the service at large we shall have gone as far as we can, for there is no immediate prospect of a

golden age in which a wholesome fear of the laws' penalties can be dispensed with entirely.

REWARD

The man who works only for the material reward involved isn't apt to be a very safe reliance at times when the reward offered looks small compared with the effort, hardship or danger involved in the work. We must have higher motives than this to produce men who will be faithful under all the difficult conditions of military service. On the other hand, "The laborer is worthy of his hire" and it is right that men should look forward to proper recompense for their efforts.

In times past it has been difficult to convince men in the navy that they were getting such recompense; now, however, the service offers a great deal in the way of financial independence for life to the average man who sticks to it for 16 or 20 years. The benefits of the new pay system for enlisted personnel, particularly in regard to reserve and retired pay have been presented to the service at large most convincingly by the Bureau. Those who heard the advantages so lucidly stated and saw the illustrative charts were much impressed, but such impressions fade quickly in the minds of young men whose ears are better attuned to the tales of easy money on the outside. There is also the constant stream of new recruits to be considered, so that, if an understanding of and belief in the financial attractiveness of the naval service are to be maintained, the officers on ships and at training stations must keep the feeling alive by thorough study of the system and frequent explanation of the whole subject, particularly to newcomers and to the man about to be paid off, with a pocket full of money and the feeling that "the world is his oyster."

Promotion is another kind of reward that is a valuable aid in disciplinary matters, but it is to be used with discretion if we are not to produce the type of man who tries to shift constantly from job to job or from ship to ship in the pursuit of possible ratings. Character should count for quite as much as professional ability when men are promoted to positions involving added authority and responsibility. We have all seen the petty officer who knows his job thoroughly, but causes dissension and discontent wherever he goes.

Cash prizes for marksmanship, etc., are useful, though they are of worth chiefly in inspiring emulation and interest rather than for intrinsic value.

Special privileges in the way of liberty or temporary relaxation of discipline, special "spreads" in recognition of good work may also be classed as material rewards and are useful, always provided the rewarding is not carried to such an extent that it is expected every time any one does his simple duty.

To sum up, reward and punishment are both essential to the maintenance of military or any other discipline, but when you find a man who can be reached in no other way than by hope of reward or fear of punishment, better get rid of him. A discipline which depends solely on these impelling forces is absolutely certain to break down under strain, as that of the Russian Navy did when the officers ceased to inspire fear.

PUBLIC OPINION

It has already been shown that we are largely debarred from the use of ordinary public opinion as a disciplinary force when we are dealing with the special conditions of military life. It is a tremendous force in all communities and will grow up in all communities that have any permanence; but, as any one knows who has had dealings with schools or other large aggregations of boys or young men, it is entirely possible that the public opinion which grows of itself, like Topsy, may be so warped that the evil in it is equal to the good. That kind of public opinion is a menace to military organizations. Because of the suspicion and distrust of military discipline that is so prevalent, service public opinion is more than apt to glorify the man who successfully evades or resists such discipline and this brand of service opinion is, in too many cases, upheld by people outside the service.

Public opinion can be created, but here we meet another difficulty, for such opinion must in large measure be produced by an appeal to the emotions and emotionalism is as nearly as may be the direct opposite of discipline which is the control of instinct and emotion, by rule and authority. The solution is that we use emotional stimuli to produce a state of mind that will consent to rigid restraint when these restraints are necessary to the accomplishment of an object. For example, the strong emotions aroused

by athletic contests furnish the motive in a football team for the rigid restraints and hard work of training and practice.

The first step in the creation of a valuable public opinion in the service is to break down the feeling that no one knows or is interested in the individual and hence that his conduct makes no difference if he can avoid punishment. When he feels that he is a necessary part of his division and a well-known member of the ship's company, much has been accomplished, and if, in addition, he believes his division to be the best in the ship and his ship the best in the fleet, the problem is practically solved. Competition is without doubt the quickest and easiest method of obtaining the result provided the competitive spirit does not degenerate into ill-natured jealousy which is destructive to a broad service spirit and hence kills any service-wide public opinion which we wish to create.

Genuine interest tactfully expressed by officers in a man's work or play is of the utmost value in forming good public opinion. Credit publicly given when credit is due helps, but don't be too effusive, or you will merely embarrass the man, and give a handle to those who may accuse him of bootlicking. The thing to strive for is a condition aboard ship where the men themselves will admire and express their admiration for the sailor who is a good man-o-war's man.

Among officers, particularly those who have spent four years together at the Naval Academy, there is a widespread acquaintance throughout the service that is a great help in producing navy spirit and navy opinion as distinguished from ship spirit and ship opinion. Officers also are more apt to know the proud history of our navy, and its honored traditions, which should form the foundation of all our service opinion. About the only obvious and universal evidences of common training and common navy customs that the enlisted man sees are the uniform and the salute which is reason enough in itself for our most earnest effort to have both uniform and salute respected. Try to impress it upon the men that the civilian identifies the military man by uniform and salute and is far more apt to respect the clean and correct uniform and the snappy salute, than the slovenly uniform and the sloppy salute that looks as if it were given only because the saluter is afraid to neglect it entirely. Above all let there be no failure on the part of the officer to wear his uniform properly

and to return every salute punctiliously. There have been far too many such failures of late and one such undoes the work of weeks of precept and training.

CONSCIENCE AND SELF-RESPECT

Probably the necessary first step in creating a seaman-like conscience and awakening a seaman-like self-respect lies in arousing a man's interest in some phase of his work. All the methods of arousing service public opinion are of assistance in this for a man's own interest in any subject is very dependent on the interest of his fellows in the same subject. Praise for a piece of work well done, no matter what its nature, may be the turning point in a man's service career. I have seen a recruit mess cook of the messiest sort, praised by his captain for a good looking table at Saturday inspection, take a new grip on life with this little boost to his self-respect and from that day start on a course of honest effort that gave him a rating within the year.

Rousing a man's interest by finding a job that is congenial is often of the greatest value. We cannot constantly shift men from job to job and have the ship's work go on, nor can any amount of shifting satisfy a discontented temperament, nevertheless much may be done in that direction if you take the trouble to know your men. After the service conscience is well-developed men will do distasteful work from a sense of duty; if they are utterly disgusted in the beginning, the conscience may never develop.

By many people self-pity is mistaken for self-respect and a more serious error would be hard to find, for the man who indulges in self-pity becomes a whiner than which nothing is more contemptible. The antidote for self-pity is an honest pride and every effort should be made to develop such pride without allowing it to degenerate into stupid egotism. Pride makes for truthfulness and honorable dealing, self-pity for lying and shiftiness; the mast gives plenty of examples of each from day to day.

Cooperation, taught by precept and example in the every day work of the ship, is the best of schools for the development of a service conscience. Everything said under the heading of punishment on the subject of cooperation and fair dealing with shipmates applies with double force when dealing with moral discipline. Most of our young men believe in fair-play and, if you can con-

vince them that the comfort and success of their shipmates depends in no small measure on their efforts, you have gone far on the road to a well-developed service conscience. The importance of each individual doing his own job well no matter how unimportant it seems can be exemplified in endless ways. One of the most striking and effective examples was the substitution of a green man for a trained one in the least important station of a well-drilled turret's crew. The time of loading was about doubled and the members of the crew saw the point and commented on it without a word from the turret officer.

Constant nagging about truth, honor and duty will do more harm than good, nevertheless we must not be afraid to mention such subjects at suitable times. Above all try to make men feel that you confidently expect to find truth, honor and loyalty in them and, as a rule, the qualities will appear. Confidence begets loyalty and truth just as surely as suspicion and distrust beget deceitfulness.

Finally, let me urge again that we keep constantly before the men the idea that discipline is the one essential to reasonable comfort under crowded shipboard conditions. It is so concrete, so obvious, that every recruit can accept the fact without long experience. Once the necessity for discipline even to a limited extent is brought home to him, we have a foundation upon which to build our structure of habitual, intelligent and self-respecting discipline that is the ideal for our American Navy.

In looking over what I have written on this subject of discipline, I was somewhat surprised to find that the words obey and obedience do not appear once. The failure to use those words was entirely accidental; but not, I think, without significance. To the nonmilitary man discipline means nothing but forced obedience to the will of others; to me, who has lived under military discipline for 25 years, obedience to duly constituted authority is so reasonable and natural that I never think of it at all. Far from finding obedience humiliating, it is merely a part of the job like the steering of the ship or the firing of the furnaces. One's mental and moral independence is in no way weakened by submitting his acts to a discipline in which he believes, even though some of the individual requirements may not appeal to his judgment. The true

sailorman sums it up by saying " It's all in the day's work " and shows his pride and self-respect by doing the day's work to the best of his ability.

If self-respect is no enemy of discipline, egotism very decidedly is and it is injured egotism that produces complaints both long and loud of the awfulness of military discipline. The man with too much ego spends all his time feeling sorry for himself and growling about a lack of consideration from his superiors; but it is a rule, never broken so far as my experience goes, that such a man placed in a position of authority is harsh and overbearing to his subordinates. The reason is the same in both cases, he sees only his own side of the matter.

Paradoxical as it may seem, the navy is, in the best sense of the word, a socialistic organization whose motto might very well be " From every man according to his abilities, to every man according to his needs." Like every other socialistic body it will founder on the rock of selfishness unless, through military discipline, we can blot out petty and unessential individualism for the good of the service.

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APPROXIMATE ALTITUDE AND AZIMUTH

By Lieut. Commander L. V. Kielhorn, U. S. C. G.

It is the purpose of this article to show the practical value of a little used spherical projection for the determination of azimuths of heavenly bodies with sufficient accuracy for plotting positions by the Marcq St.-Hilaire method, for finding approximate altitudes so that a sextant may be set and the bodies picked up on the horizon, and for identifying stars and planets.

Fig. 1 is a stereographic projection of the celestial sphere on the plane of the horizon for Latitude 40. The projection of the zenith of the observer is at the center of the diagram. Passing through this projected point are two straight lines at right angles to each other, representing the projection of the meridian and the prime vertical of the observer, the extremities of which mark the north, east, south and west points. The curved lines intersecting at the pole are hour circles and are plotted for each 10-minute interval from the central meridian, marked negative east of the meridian and positive west of the meridian. The circles at right angles to the hour circles are diurnal circles and are shown for each five degrees of declination. For convenience these circles may be called declination circles.

It will thus be seen that the projection is a map of the heavens for the latitude of the observer with the observer's position at the center and that any heavenly body may be projected upon it having given its declination and local hour angle as coordinates, provided it is above the visible horizon. The direction of the body's plotted position from the center of the diagram is the azimuth of that body and the bearing may be read off directly on the graduated arc forming the periphery. A straight edge passed through the center of the diagram and the plotted position will facilitate the reading of the azimuth. Thus, by reference to the diagram (and

to Fig. 2) a star whose hour angle is three hours west of the meridian and whose declination is 15 degrees north, bears 250½ degrees. When the sun has an easterly hour angle of six hours and a declination of zero a glance will show that it is in the horizon,

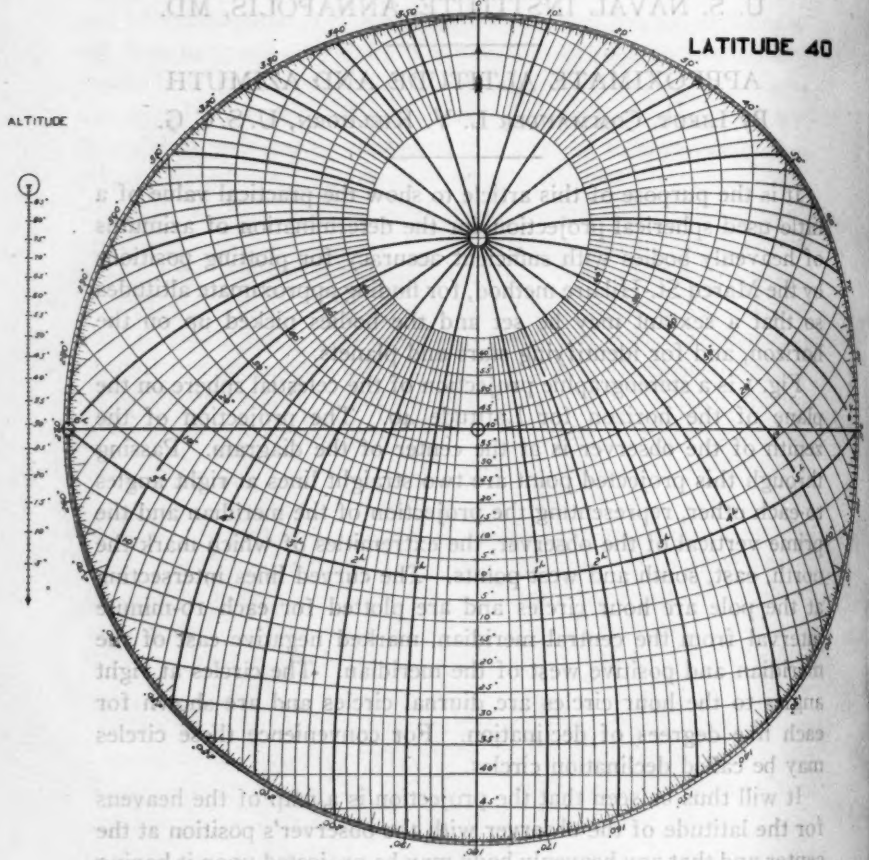

FIG. 1.

bearing 90 degrees. When this same body has easterly hour angle of three hours (and the same declination of zero) it will bear 122¾ degrees. Let use follow the diurnal path of a body whose declination is 15 degrees north: It will be in the true horizon when its hour angle is (—) $6^h\ 52^m$ and will bear 70¼ degrees. It will cross the prime vertical when its hour angle is $4^h\ 48^m$ and

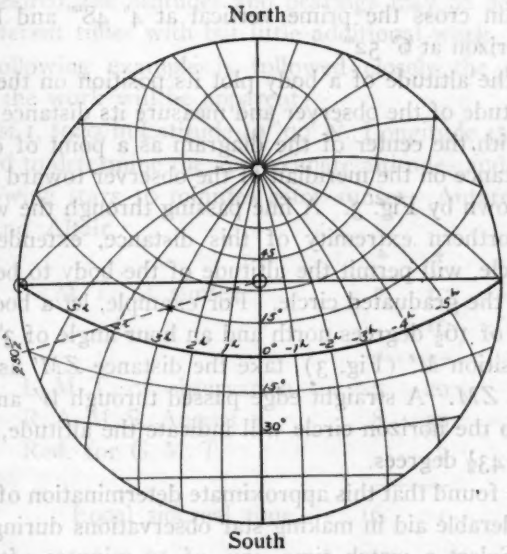

FIG. 2.

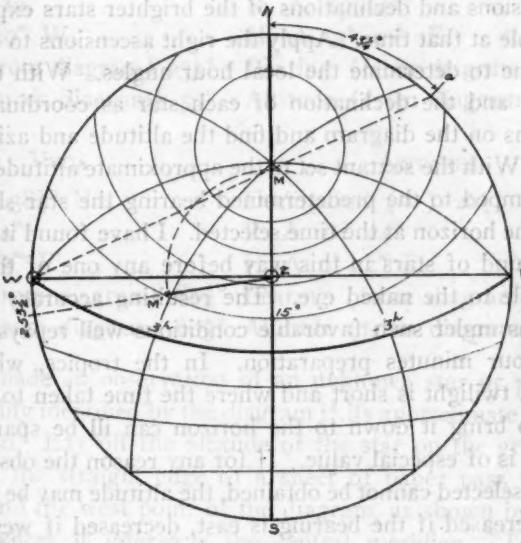

FIG. 3.

will cross the meridian, bearing south, when its hour angle is zero. It will again cross the prime vertical at $4^h\ 48^m$ and be in the western horizon at $6^h\ 52^m$.

To find the altitude of a body plot its position on the diagram for the latitude of the observer and measure its distance from the center. With the center of the diagram as a point of origin lay off this distance on the meridian of the observer toward the north point as shown by Fig. 3. A line passing through the west point and the northern extremity of this distance, extended to the horizon circle, will permit the altitude of the body to be read off directly on the graduated circle. For example, let a body have a declination of $16\frac{1}{2}$ degrees north and an hour angle of $3^h\ 7^m$ west. Plot its position M' (Fig. 3), take the distance ZM' as a radius and lay off ZM. A straight edge passed through W and M and extended to the horizon circle will indicate the altitude, which in this case is $43\frac{1}{2}$ degrees.

It will be found that this approximate determination of altitudes is of considerable aid in making star observations during evening twilight. Select a watch time, say, of 10 minutes after sunset (for a latitude of 40 degrees) and find roughly (to the nearest minute) the corresponding local sidereal time. Then look up the right ascensions and declinations of the brighter stars expected to be the visible at that time. Apply the right ascensions to the local sidereal time to determine the local hour angles. With the local hour angle and the declination of each star as coordinates plot the positions on the diagram and find the altitude and azimuth of each star. With the sextant set to the approximate altitude and the pelorus clamped to the predetermined bearing the star should be found on the horizon at the time selected. I have found it possible to get a round of stars in this way before any one of them was easily visible to the naked eye. The resulting accuracy of such observations under such favorable conditions well repays for the three or four minutes preparation. In the tropics, where the duration of twilight is short and where the time taken to find the star and to bring it down to the horizon can ill be spared, this "wrinkle" is of especial value. If for any reason the observation at the time selected cannot be obtained, the altitude may be changed slightly, increased if the bearing is east, decreased if west, in an amount depending on the interval and bearing, or if greater ac-

curacy is desired, the altitudes and bearings may be determined for two different times with but little additional work.

If the following example is followed closely the ease and rapidity of the work will be apparent:

On August 1, 1920, in Latitude 40° 00′ N., Longitude 45° 00′ W., it is required to determine the approximate altitudes and bearings of the following stars 10 minutes after sunset: Antares, Vega, Arcturus, and Altair.

	h	m
L. M. T. of sunset	7	10
		10
L. M. T. of observation	7	20
R. A. M. S. August 1	8	39
Red. for G. M. T.		2
Local sidereal time	16	1

ARCTURUS	ALTAIR
Declination 19½° N.	Declination 8⅔° N.
R. A. 14^h 12^m	R. A. 19^h 47^m
H. A. 1^h 49^m W.	H. A. 3^h 46^m E.
Bearing (from diagram) 237°	Bearing (from diagram) 106°
Altitude (from diagram) 59°	Altitude (from diagram) 31°

VEGA	ANTARES
Declination 38⅔° N.	Declination (—) 26¼°
R. A. 18^h 34^m	R. A. 16^h 24^m
H. A. 2^h 33^m E	H. A. 0^h 23^m E.
Bearing (from diagram) 80⅔°	Bearing (from diagram) 174⅓°
Altitude (from diagram) 60⅔°	Altitude (from diagram) 23½°

Having made an observation of an unknown star or planet it may be readily identified by the diagram if its approximate bearing is taken also. Lay off the altitude of the star on the graduated circle. Let the straight edge of a sheet of paper pass through this point and the west point of the diagram, as shown by Fig. 3 and note where it intersects the central meridian. Take the distance from the center of the diagram to this intersection and

lay it off in the direction of the bearing of the star, with the center of the diagram as a point of origin. The extremity of the line is the plotted position of the body, and its hour angle and declination are at once determined. Apply the local sidereal time to the hour angle to find the right ascension, and reference to the nautical almanac will complete the identification. An example may be more to the point.

On May 1, 1920, at $10^h\ 00^m\ 00^s$ G. M. T. ($7^h\ 38^m\ 05.2^s$ L. S. T.) in Latitude 40° 00′ N., Longitude 75° 00′ W., a bright star was observed through a break in the clouds at an altitude of 43° 15′, bearing 253½° true. What is the star's name?

Solution: Referring to the diagram and to Fig. 3, lay off the altitude of the star *Na* (43° 15′) and let the straight edge of a sheet of paper pass through *W* and *a*, intersecting the central meridian at *M*. With *ZM* as a radius and *Z* as a point of origin lay off *ZM'* in the direction of the star's bearing 253½°). *M'* will then indicate the declination of the star, which in this case is 16° 30′ N., and its hour angle, which is $3^h\ 7^m$. Subtracting the hour angle from the local sidereal time gives $4^h\ 31^m$, its right ascension. Reference to the nautical almanac identifies this star as Aldebaran.

The projection shown by Fig. 1, while designed to be used for Latitude 40° N., may also be used for the corresponding parallel of south Latitude, the only change necessary being to shift the azimuth scale 180 degrees.

As the projection is sufficiently large when constructed with a diameter of eight inches a set made for each degree or for each 2 degrees, covering 60 degrees of either north or south Latitude, forms a small convenient pamphlet, an advantage which, with its wide range of usefulness, will commend itself, it is hoped to the navigator.

The author has constructed for his own use a set of these projections, a blue-print copy of which he will be pleased to send any officer who would like to give them a try-out.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

GUNNERY AND TURRET DESIGN

By COMMANDER H. F. LEARY, U. S. Navy

Naval gunnery is the science and art of using guns at sea.

As a *science,* it deals with the motions of projectiles, elucidates the laws which govern their deviations; determines the probability of their attaining the objects aimed at and calculates their effect.

As an *art,* it is concerned with the actual handling of guns and studies how to obtain accurate and rapid fire from a single gun and how most effectively to combine the fire of a number of guns.

It is the art of gunnery which should principally concern the naval officer, the highest object of whose ambition it should be to make the fire of the guns under his command, whether a single gun, a turret, a ship's battery, or the combined batteries of a squadron, the most effective possible.

The *theory* of gunnery, except in an elementary way needs but the attention of the specialist; the *practice* of gunnery is essential to the efficiency of every naval officer, and may almost be said to be his proper life-work.

It is the gun which is the determining factor in naval actions, and to the gun everything else should be subordinated in the design, construction and tactics of warships. The other features of men-of-war have no *raison d'être* except in so far as they serve to bring the guns into action and to maintain them there. Protection to buoyancy and stability is merely for keeping the battery afloat, and protection to guns and men is merely for maintaining the battery in operation under hostile fire; coal endurance and speed are merely for extending the battery's field of action. All these things give endurance and power to the battery. The essential object of the officers and men too, from the commander-in-chief down, is to use the ship's batteries. The fighting efficiency is measured by their ability to do good work with the guns which they control. They may one and all be at the highest point of efficiency in every other branch of their profession, skilled in seamanship, and in navigation, linguists, well versed in military and international law, and all these things may avail them nothing in that decisive hour of battle, for which their lives should be a preparation; *then* it will depend primarily upon their skill in gunnery, upon how effective the gun fire of the ship or of the squadron is, whether

they shall triumph or go down to merited and perhaps even disgraceful defeat.

The efficiency of every warship in the last analysis is the efficiency of her battery, and it is the highest duty of every officer on her, and above all her commanding officer, who is responsible for her efficiency, not only to see that the best possible results are obtained from the material on board, but also to see that defects in material and equipment are remedied, and that any possible improvements are recommended for adoption. Of course there will always be defects in our ordnance material, but they can only be remedied and improvements made through the co-operation of the officers who are using them with those who control their design and construction. If we are to hope for steady progress towards perfection our Bureau of Ordnance must be ready at all times to make changes which are real improvements, and at the same time those afloat, while unremitting in urging improvements must do their utmost with what they have, and not assume the attitude of the poor workman who blames his tools for his bad work. There will always be questions in ordnance about which there is difference of opinion, even among those best qualified to pass opinion, but the freest possible discussion, and honest constructive criticism of ordnance designs and gunnery methods cannot but lead to marked improvement.

It may be well to start with a short summary of the progress of gunnery in our navy, in order to show how from year to year the requirements have progressed and the demands for improved material have produced the changes desired and have led to the adoption of our present equipment. The Ordnance material and methods in use at the time of the Spanish war were for that day considered excellent, and it is doubtful if at that time our turrets or methods were surpassed in the British, French, or German navies. After the Spanish war, however, in considering the lessons learned and the needs in ordnance and gunnery, for our modern navy, a marked change took place. Officers in our service began to realize that the types of target practice then in vogue, and the general battle conditions which our material should be called upon to meet were not in accord; that the practices did not create sufficient interest on the part of officers and men, did not test the ordnance material to the extent necessary, nor were the practices so difficult as to create a demand for improved equipment. It is interesting to note that in March, 1900, the commanding officer of the *Amphitrite* submitted to the Bureau of Navigation recommendations regarding a uniform system of gunnery instruction based on the experience of that vessel as a gunnery training ship and it is quite remarkable to note the many

points considered at this time which are now current practice in gunnery training. Based on these recommendations, the Bureau of Navigation issued General Order No. 9 of September, 1900, covering gunnery instructions for cruising vessels. This was the first real start on systematic gunnery training. About this time, Admiral Sims, then a lieutenant who was on the Asiatic Station, recommended sweeping changes in the methods of gunnery training then in force, based on information obtained from methods being tried out by the British. He, in conjunction with several officers of that station, made alterations in gun sights, bought telescopes, and requested a new system of target practice, based on his ideas of the proper methods for gunnery training. A strong appeal was made to the Navy Department to institute some such system of target practice for the whole navy. This was done by President Roosevelt; and Admiral Sims was appointed as Director of Target Practices. There was a great deal of opposition on the part of a number of the officers to such radical changes; a great many thought then, and there are some who now think, that it is unnecessary to have competition in order to produce efficiency. In 1903 Professor Alger wrote his prize essay on "Naval Gunnery," an extract from which is quoted at the beginning of this article. In March and April, 1903, the Atlantic fleet took up this new system of target practices and held them off Pensacola, Fla. On board the old *Texas* (San Marcos) Captain Nulton, then gunnery officer, developed a fire-control system and various schemes of checking sight setters, sending ranges, spotting and analyzing results; and, strange as it may seem, the methods of analysis now in use in the fleet are not very dissimilar from these early efforts. At the first target practices, held off Pensacola and on the Asiatic station, the results were very good considering the material. It was shown, however, that changes would have to be made in methods of handling our ammunition, graduating sights, and in the systems of obtaining and transmitting the range. During the following years, everyone was keyed up on the subject of gunnery. Gunnery instructions were issued in 1905, explaining in detail the new system, showing how the training should be conducted and giving the principles of the elementary fire control then necessary, and how the practices should be conducted.

As the result of several years work it was demonstrated that turret arrangements were not safe; this was evidenced by the *Massachusetts* explosion in an 8-inch turret in 1903; the explosion in the after 12-inch turret of the *Missouri* in 1904; an explosion in the 13-inch turret of the *Kearsarge* in 1905, and again on the *Georgia* in 1907 (8-inch turret). It began to look as if the navy could not hold a target practice without some terrible casualty. Everyone in the fleet was doing his utmost to make his turret, battery and ship shoot fast and hit. Some mistakes were of course made in the handling of material, but on the whole it cannot be said that the unfortunate accidents were wholly the fault of the personnel. We learned by bitter experience, and it is most fortunate that the efforts made by a few misguided officers to have the practices abandoned were not successful.

The explosion on the *Missouri* brought about the installation of the gas ejector system, flame shutters between the turret chamber and handling room, and the two-stage turret hoists fitted on all ships from the *Michigan* class on. It became known what a "flare-back" might do. The accident on the *Massachusetts* brought about precautions in regard to opening the breech plug, and improved designs of firing locks; that on the *Kearsarge* called attention to the danger of exposed switches in the turret in rear of the breech; in fact, the present "Safety Precautions" were built up on lessons learned in those days, and to those of us who followed the game each precaution has its own history.

In 1907 at the time of the cruise around the world, a Turret Board was ordered to make a thorough investigation into the defects and needs of the navy, regarding turret design and construction. General recommendations were laid down which should guide the Department and Bureau of Ordnance in the design and operation of turrets. These continued in effect, being revised from time to time, until the recent revised Turret Board's report of 1919. It is rather surprising to see that in the period of 10 years, from 1907 to 1917, the general principles of turret design and construction had not changed as much as one would expect. The developments led to the introduction of the two-stage hoist and three-gun turret, but the general requirements remained much the same. It may also be noted that after the investigations made by the Turret Board in 1907, and due to the various precautions put into effect, and the modifications made to nearly all turrets,

but few accidents have happened. Meeting the demands of the fleet, the officers in the service themselves devised and superintended the manufacture of improved sights, breech mechanisms, and turret gear; and also outlined the methods necessary adequately to serve and control the guns. The "Ship and Gun Drill Book" was prepared by a board of experienced turret and battery officers. In 1913 the "Gunnery Instructions" were revised and the manual now in use (1920) is based mainly on this work.

The fact that the above results were not all done earlier is not considered as a criticism upon the officers in the service prior to 1900, nor of the ability, desires, or work of the navy at that time. With the small amount of money and lack of attention given to the navy during this period by Congress, and the few new ships authorized for a more modern navy there was not the opportunity or incentive to make such strides as have existed since then. So from the Spanish War up to the present time the navy has expanded in every direction, and the forms of gunnery exercises have kept pace with the world's leading navies; ever making greater demands for improved methods and material. Especially since the beginning of the last war, the service has constantly had before it the question, "Are we equipped with the best material and using the best methods that can be *used for action?*

Just because a ship does well at target practice is no absolute criterion of her readiness for battle, and in the battle efficiency inspection begun in the fleet by Admirals Fletcher and Badger, and perfected by Admirals Mayo and Grant, many ships were found that were not entirely ready for battle; and it was found that not all the material in use was sufficiently adequate in type or quality successfully to compete with the British or German navies in a modern naval engagement. After much argument in 1915, rules were formulated to open fire at long range (18,000 yards). This change was urgently recommended by Admiral Fletcher, then commander-in-chief of the fleet, and put in the Rules by a committee from the fleet, of which Captain Kearney was the head, as fleet gunnery officer. The results were most gratifying; since then the fleet has felt confidence in its ability to open fire at the maximum range of its guns, and turret designs were changed to give increased angles of elevation of 30° for vessels of the *Tennessee* class and 40° for the 16-inch 50 ships cali-

ber. The recent improvements in design have included the adoption of a quick-acting breech mechanism for turret guns in which the motion of translation of the plug has been eliminated, and the closing is effected by an air cylinder, very little power being required as the weight of the breech block is taken by counterbalance springs. All turrets since the *Michigan* have been fitted with chain rammers, which are a material improvement over the old telescopic rammers, with their wire cables, which were a frequent source of casualties. In all new designs, the powder and shell supply to the guns has been separated, and the vertical reciprocating shell tube is now the standard in all modern turrets, the powder supply being either by a reciprocating car or a conveyor type hoist. The design of gun trunnions has been improved materially of late and is now considered as being entirely satisfactory as regards reduction of friction and self-lubricating features. The period during the war has witnessed the general introduction of the director system of firing, and this system, for both main and broadside batteries, has now been adopted as the primary system, as opposed to the old system of pointer fire. The advantages are many and well known, and due to the extreme difficulties of target designation, and of seeing the target at long ranges, and through smoke, splashes from enemy shorts, etc.; the use of aloft directors has become general. The demands of concentration firing, aeroplane spotting and use of kite balloons have also added some minor changes. The increase in battle ranges has led to the adoption of the pneumatic recoil and counter recoil system, as the spring designs were unsatisfactory for returning guns to battery at the high angles necessary. It is believed that the above covers in a general way the features of importance, that have been brought out by gunnery development, and we will consider the question of turret design in general terms.

About 12 years have elapsed since the construction of the dreadnought was decided upon, and this period has witnessed the developments in the design and armament of capital ships, which may be taken to cover the progress of modern armament, as the revolutionary changes introduced at that time furnish a definite starting point. The plans of this type of ship introduce a new governing principle into battleship armament, which has become known as the "all big gun," or "single caliber" armament in

contradistinction to the previous type of armament. The former policy of installing a mixed battery with generally four guns of the heaviest type, and a large number of intermediate and secondary guns, was due to the erroneous belief that it was not advisable to increase the number of heavy guns due to the large increase of weight involved, and the low rate of fire from these guns. The intermediate guns by their great volume of fire, were considered more effective against the personnel and upper works of the enemy, thus silencing his fire. It has been definitely established as a result of target practice, that the heavier the projectile the more accurate the shooting will be, and as the standard of gunnery efficiency is "*rapidity of hitting,*" the "all big gun," "single caliber" ship has become recognized as affording the maximum of effectiveness. Additional reasons for this type are: the amount of armor that can be installed on a ship being limited, it is impossible to assign sufficient weight adequately to protect a long broadside of intermediate guns against the fire of heavy guns; also the presence of smaller guns reduces the rapidity of fire, hence the effectiveness of large guns due to the interference in the fire control arrangements. Modern vessels are now being successfully armored against the fire of small guns and the personnel will be behind this armor; thus the small gun will be useless except for defense against torpedo attack. The high state of development to which gun and torpedo fire have been brought has also led to an increase in the probable future battle ranges, again militating against the use of small guns. The selection of the caliber and type of gun for the primary armament of a battleship is a problem still open to great controversy. At the present moment there exists a fairly strong current of opinion in favor of increase of caliber, as shown in the armament of the most recent ships of the principal naval powers. This general change of opinion which has taken place relative to primary armament is to be attributed in part:

(a) To the increase in battle ranges.

(b) To the improvements in ship protection.

(c) To the practice of filling armor piercing projectiles with high explosives.

The increase in battle ranges and the improvements in armor both necessitate an augmentation in the striking power of the

battery. There are several ways of accomplishing the desired result:

(1) By an increase in the caliber of the gun.

(2) By an increase in the weight of the projectile.

(3) By changing the shape of the projectile to obtain better ballistic qualities.

(4) By increasing the initial velocity.

(1) It has been demonstrated by actual firing that a gun of larger caliber, having a moderate initial velocity is able to fire a far greater number of accurate rounds than a gun of smaller caliber having a high velocity. Thus, since for the same velocity, at the same range, the penetration increases with the caliber, for a given penetration, the greater the caliber the lower the velocity, and the longer the life.

(2) If the weight of the projectile is increased, while the initial velocity remains the same, a greater amount of energy is obtained by an increase in the weight of the charge and an increase in the maximum pressure, which means an increase in the erosion of the gun equivalent to a diminution in accuracy and in the life of the gun. An increase in weight of projectile with a lower muzzle velocity may give better penetration at long ranges ,but the loss in danger space must also be considered. An increase in the angle of fall also increases the cross-breaking stresses of the projectile on impact with vertical armor.

(3) By changing the shape of the projectile, a very material increase in range with corresponding increases in flatness of trajectory and in danger space, and finally in striking velocity and penetration, are obtained, especially at long range. By changing the radius of the ogival head from $2\frac{1}{2}$ to 7 calibers, the striking velocity has been increased by fully 30 per cent. The value of this change cannot be emphasized too strongly, for it is a gain in the true sense of the word, since it increases the value of a gun 30 per cent without any cost whatever; the charges, the velocity, and the pressure being the same for a long pointed projectile as for a blunt pointed one, the gain being entirely due to the reduction in the resistance of the air to the projectile in flight.

(4) By increasing the initial velocity, the striking energy of the battery can be increased, but in this case as well as that of the increase in weight of the projectile, the gain cannot be obtained without increasing the charge, the maximum pressure, and the

erosion, consequently, not without shortening the life of the gun. If, however, the same muzzle energy of the gun is used, the heavier projectile will show better than the lighter, high velocity one, especially at the longer ranges.

The practice of filling A. P. projectiles with high explosives is now universal. The general tendency at the present time is to require projectiles not only to perforate the heaviest armor now existing, but also to carry a large charge of high explosive. If a large projectile has a penetrating power greater than the heaviest armor, it is clear that the capacity of the shell cavity can be increased more than proportionately to the increase of caliber. Thus the larger the caliber, the greater the shell cavity, the heavier the bursting charge, and the greater the efficiency of the projectile.

As before stated, it has been proved by actual firing that the heavier the projectile, the more accurate the shooting; consequently, from the viewpoint of accuracy, penetration, and effectiveness, the caliber of the gun in the primary armament should be as large as possible. Now, the larger the caliber, the heavier the armament; and the greater the space required for its installation on board ship, where these two factors, weight and space, are always limited; consequently, as in most engineering questions a compromise must be made to determine the "smallest big gun" that will fire a projectile that not only penetrates at *battle ranges*, the heaviest armor afloat, but also carries a sufficient quantity of high explosive to insure the desired effect *behind the armor*, all this with a reasonable margin of assurance and no more.

The most advantageous composition of battery, as regards the caliber, having been determined, it remains to decide upon the arrangement of the battery, in order to obtain the greatest arc of fire, or maximum fire efficiency from each gun. As the ahead-and-astern fire is necessarily limited and must always be less than the broadside fire, it follows that main engagements will tend to use broadside fire in order to have the maximum number of guns in action; and, as a gun that fires on either broadside is equal to two guns that fire on one side only, the endeavor is to place all, or as many guns as possible, on the center line, due regard being paid to obtaining the greatest height above the water line consistent with maintaining the proper stability of the vessel. Great care is also necessary to avoid "interference" between guns due

to the blast effect, etc. Superposed turrets, which increase the number of guns are objectionable, as they are too cramped to furnish proper ammunition supply, and add materially to the height of the enemy's target. It was the recognition of the above principles by American designers, in the plans for the *Michigan* and *Delaware* classes of vessels that first led the way to the now accepted designs for vessels of this class. The most conspicuous result of the adoption of the "all big gun" principles has been the intensified competition between naval powers for the possession of the largest and most powerful units, the result being an expansion of dimensions aimed at increasing the actual or proportionate power of the broadside by adding to the number of guns available on the beam. The first vessels built on these principles for Great Britain, Germany, Japan, and the United States, all had eight guns bearing on the broadside, but with differences in the aggregate power required to produce the broadside. The *Michigan* class obtained it with a total armament of eight big guns, having four twin turrets on the center line. The original dreadnought needed ten guns, having only three turrets on the center line and two abreast on the beams. The German and Japanese had six twin turrets to produce an 8-inch broadside, two turrets on the center line, the other four being placed in pairs abreast. The "*beam fire efficiency*" of the various types—the relation of broadside to the total armament—was, therefore, 100 per cent for the United States, 80 per cent for the British, and 66.6 per cent for the German and Japanese. The United States design undoubtedly *was,* and *is,* the most efficient, and has been consistently followed ever since by its Navy Department. All other powers have come to the center line arrangement for their capital ships, the differences being merely in the number and caliber of guns adopted for the primary armament. The American practice is that the controlling factor in battery arrangement is the number of turrets and not the number of guns, and it is believed that the four 3-gun-turret-arrangement presents the best all around solution of the problem.

To sum up, the general conditions governing the primary armament of the modern capital ship are as follows:

(1) The greatest weight that can be allowed to the armament.

(2) The number of guns required.

(3) Their disposition within each turret (twin, triple, quadruple).

(4) The disposition of the turrets (superposed, etc.) affecting the weight of armor carried.

(5) The weight and number of rounds of ammunition carried.

It is evident that for similar types of guns and turrets, the larger the caliber of the gun, the larger will be the turret and the greater the ammunition weights; and although modern design has done something to reduce the ratio it is still very large.

In one respect, the theoretically perfect arrangement of guns of a fleet would be to have them mounted in single turrets widely separated. Then damage to one gun would not put another good one out of action, but to do this would necessitate a ship of enormous size, and other vital characteristics would have to be surrendered. Economy of space could not be obtained in a single gun turret and all machinery and other mechanical equipment necessary for the control and service of the battery would be required in complete sets for each gun; whereas, in the case of more than one gun in a turret, a certain part of this mechanical equipment can serve all guns in the turret. Upon the other hand the theoretically perfect arrangement for director firing would be to have all guns on a ship in one turret in one mounting. With one ship engaged such an arrangement would invite defeat owing to the chance of all guns being put out of action by one shot. But if several such ships were engaged the effect on the outcome of the engagement is reduced as the number of ships engaged (within reasonable limits) is increased.

In general, the developments in turret design have progressed from the use of a single gun in a turret, to a maximum of four guns in a turret. It may be accepted that this development is based upon sound principles and follows a corresponding increase in the size of the navies of the principal powers. The primary objects to be accomplished in the design of a turret are accuracy and rapidity of gun fire, and efficiency and reliability of all mechanical features of the turret, combined with the maximum possible protection against damage by the enemy's gun fire. The details of gun and mount should be worked out to eliminate excessive dispersion, and to avoid any increase in dispersion, caused by any progressive, permanent deflection in metal which is placed in

stress, by the forces resulting from the discharge of the guns. The various machines installed for use in the service of the guns should be designed with a liberal factor of safety to insure continuous operation, over an extended period of time, and should be simple in design to facilitate upkeep, and to avoid the necessity of too much mechanical skill and experience on the part of the personnel. Protection is similar to insurance against accident and should be the maximum which can be obtained without undue sacrifice of accuracy of gun fire and mechanical reliability.

In the consideration of alternate turret designs it is accepted that all of the best conditions cannot be found in one design but that the design chosen must be superior in most of the important requirements.

The most important subjects that require consideration in connection with turret designs are:

(a) Accuracy of fire.
(b) Rapidity of fire.
(c) Simplicity and reliability of operating machinery.
(d) Strength and reliability of turret structure.
(e) Size of barbettes and dead weight of turrets.
(f) Protection of gun, mounting, and personnel.

From the constructor's point of view it has been practically demonstrated that the weight of installation *per gun* is the least for a 3-gun turret, and increases in both directions from this number, due to the fact that the space occupied by that portion of the three guns contained inside the turret pan, is bounded very nearly by a square, which is the largest rectangle which can be inscribed in a circle. It is also true that the least weight is required for designs where all guns are carried in one slide as one supporting and one elevating system is sufficient for all.

From an Ordnance point of view the size and weight of turrets are not of great importance. Extra weight is conducive to rigidity, and consequently accuracy and consistency in the performance of the gun, while the size of the turret affects the target area presented to the enemy, but from the point of view of ship construction they both materially affect the design of the ship, and must be kept within reasonable bounds.

As stated above, the greater the number of gun emplacements, the greater the difficulty of putting all guns out of action. Recent

designs have varied between two and six emplacements per ship, and ideas recently seem to fix upon four as a happy mean between the two extremes. Two turrets forward and two turrets aft permit a most satisfactory design of the ship as a whole, and should be sufficient when it is considered that the total number of emplacements involved in the action is equal to four times the number of ships engaged. It also provides the ideal arrangement for fire control purposes, such as divided fire, etc. The abandonment of the 6-turret ship for one with four turrets naturally brought up the question of placing more guns in a turret to make up the same total number of guns; and it is believed that the practicability of this alternative, coupled with the economy of turret weights per gun, constituted the principal arguments in favor of the latest design of battleships carrying four turrets with three guns in each.

Another factor was introduced at the same time, however, which also materially affects the problem; namely, the size of gun used. This increase involves the following:

Greater damage done by one hit obtained at a cost of:
Greater turret weights per gun,
Greater size of turret,
More powerful operating machinery,
Greater ammunition weights to be handled and stowed, and
Greater cost.

All provided a reduction in the number of guns is not made.

From the 12-inch to the 14-inch no radical changes were made in the methods of handling ammunition and serving the guns, consequently the character of turret machinery was generally the same, but of an increased capacity in the larger turrets. In stepping up to the 16-inch, however, the proper handling of the heavy ammunition weights involved a certain change in type as well as power of machinery, which in general resulted in more space being required for such machinery. In following the old rule that the turret pan should be only large enough to accommodate the guns in recoil position, the proportionately greater space required by the other turret gear resulted in a more crowded turret, with less space left for the crew. Operating space was thus sacrificed to obtain a gun of greater caliber, without either reducing the number of guns, or materially increasing the size and weight of turrets.

In commenting upon the details of turret designs as they stand to date, the following points are made for comparison between the triple slide and the separate slide mountings:

(1) *Accuracy of Fire.*—In the tests and target practices so far held there is nothing to show conclusively that the accuracy of guns individually mounted is any greater or less than that of guns mounted in one slide. It may therefore be assumed that about the same accuracy of hitting, as far as present data and experience show, can be obtained by either type of mounting, as it also appears that either type permits of sufficient rapidity of fire to meet battle conditions. However, any change in gun alignment due to settling of turret structure can be corrected in the single slide mounting and not in the triple slide.

(2) *Simplicity and Reliability of Machinery.*—With the separate mounting, each gun elevates individually, unless the elevating system is cross connected. Three complete elevating sets are required and these three sets must be interconnected by a system of clutches, gears, valves, etc., which requires considerable care and knowledge on the part of the personnel properly to operate it. The system when interconnected also depends for accuracy upon that of the triangle established by the centers of gun trunnions, centers of trunnions to oscillating bearing, and centers of connection of elevating screws to the slides, as well as on the accuracy of the screw thread cut on the elevating screws. With this system, the adjustment of the three guns in the same horizontal plane can be effected; and, if the machine work on the various parts, as well as the work of installation, is accurate, then the three guns will elevate and depress parallel to each other; until damage to the system, due either to internal causes or enemy shell fire, introduces an error in the relative position of trunnion centers, oscillating bearing centers, or other parts of the system. This gives the maximum of flexibility to the system and *enables one gun to be kept in operation after the failure of its own elevating gear.* In the triple slide type of mount, the ability to elevate each gun separately is sacrificed to obtain accuracy of elevation for the three guns which must move through the same vertical angle at all times under the control of one elevating screw. *Any derangement of this elevating system, therefore, affects all three guns alike.* On the other hand, since the oscillating weights are tripled, the

elevating motors must be greatly increased in size to maintain the same rapidity of movement and handle any unbalanced forces due to blowing off a muzzle, etc. With independent slides, the damaged gun may be cut out.

With guns separately mounted, it is necessary to provide a sight for each one and the only practicable location for these sights is underneath the guns, unless the distance between guns is materially increased in order that room may be provided for a pointer's station between the guns. Such an increase in distance between guns would amount to at least 6 feet total and would necessitate a corresponding increase in the size of the turret. The guns at the high elevations now required (40°) interfere with the sight setter and pointer, and the movement of the telescope eye-piece is so great that the pointer is materially handicapped in his work of laying the gun *for pointer fire,* unless movable pointers' seats are installed. Alternative control stations are very desirable to cover cases where minor casualties place the stations in operation out of action. Three independent stations require accurate adjustment of the sighting appliances of each, but once adjusted give additional insurance. For director fire it is not necessary to have the guns cross-connected, and each gun can be independently laid not only more accurately but faster, as the motor is only handling the load of accelerating one gun, and it is believed the guns should be normally handled this way. In the case of the latest triple slide design, the work of adjusting guns with sights is simplified as the adjustment consists in aligning two sights attached to the same slide with the guns therein. It is desirable to provide, as far as possible, auxiliary means for accomplishing all the various functions involved in the service of the guns, but in the case of guns independently mounted, this can only be obtained in many cases by the installation of duplicate equipment for each gun, or, as is the case with the elevating gear, by the introduction of a cross-connecting system in order to make use of any, or all, of the three electric motors in elevating the guns, and this cross-connecting system requires considerable space in the turret for its installation.

On the other hand, the separate installations permit of correcting each gun's angle of elevation for erosion and should thus materially reduce the pattern.

The design of machinery for the three guns must be a compromise in order to secure the third gun; this has already been pointed out in the case of sights, and exists also in the case of elevating gear, which, in general, must be arranged in line with the gun and underneath it, rather than in an athwartship plane; and also in the case of shell and powder hoists where interference is experienced either with the right or left gun depending upon whether the hoists for the center gun are constructed right or left handed. Another important influence on the weight of the total gun mounting is the extent to which the alternative systems of power and hand working are employed. Furthermore, the question of perfect balance means increased weight over a design where these considerations are not weighed too carefully.

The ammunition handling machinery must be capable of rapid movement, and the methods of bringing ammunition from the hoists into the guns must be simple and expeditious, and necessitate only the minimum of fatigue to the crew, while maintaining a continuous supply over a protracted period. These requirements in design involve the question of the choice between hydraulic and electric prime movers. Reliability is the first consideration. It is essential to obviate any chance of derangements by shock or direct impact, and, as far as possible, from the shattering effect of high explosive shell bursting in the vicinity of turret gear and machinery.

(3) *Size of Barbette and Dead Weight of Turrets.*—Other things being equal, the size of barbettes for guns separately mounted must necessarily be greater than that for guns mounted in one triple slide for the simple reason that distance between gun centers must be greater to provide space for the inner trunnions. This involves a greater target to be presented to the enemy's fire, or, if the same size barbette is used in both cases, then the turret carrying the three guns in one slide will be a more roomy turret.

Size of barbette and weight of turret go hand in hand and any appreciable reduction in size, when it is realized that a 16-inch 3-gun-turret complete weighs approximately 2000 tons, means a reduction in weight which materially assists the naval constructor in producing a better design of ship. It is believed to be very difficult to design a turret structure for a triple slide which will

be as rigid as the structure for a turret mounting single slides, also the distribution of the load on the turret roller path is more satisfactorily provided for in the case of independent slides and the turret pan can be more substantially braced and tied.

If sufficient diameter of barbette is selected, shell and powder hoists can be provided for each gun in both types of turrets, but in the case of the triple slide design the advantage obtained by a smaller barbette must be given up.

(4) *Distance between Guns.*—Various turret designs in the past have involved various distances between centers of guns. On the first tests of the triple slide arrangement it appeared that the accuracy of flight of the projectiles was possibly impaired by interference between shells in flight. This interference appeared to be a serious defect, and considerable experimentation was conducted using *delay action coils* to produce successive firing of the three guns. Tests of the mount using these coils at the proving ground indicated that an improvement in dispersion was effected. Later on, in service, this delayed action idea was apparently overdone; and inaccuracies developed due to the fact that the guns were mounted on a movable platform, and fired generally on the middle of the roll, at which time the angular movement of the ship was at its maximum. Also, experimental firings showed that the variations in ignition and inflammation of the powder were much greater than those introduced by the delay coils. This resulted in the abandonment of the delay action coil, with the result that smaller dispersion was obtained. Greater separation of the guns in addition to giving less blast interference provides a stronger front plate for the turret in the single slide design, and this feature is well worth considering.

It is believed that imperfections in the design of projectiles, variations in the amount of recoil of the gun at the instant the projectile leaves the muzzle, and the question of rigidity of the mount have more effect upon the dispersion than the distance between guns. In a special firing of a 3-gun turret, when the wing guns only were fired, the patterns were substantially the same as those from a regular 2-gun turret.

(5) *Safety Features.*—It is evident that separating bulkheads cannot be installed in the turret utilizing the triple slide. This may be considered a loss of protection from the enemy's gun fire.

On the other hand, the advantage obtained shows up in the greater facility of control of the personnel as all are in one compartment.

As far as known, foreign navies do not use separating bulkheads, which goes to show that there is not universal agreement as to their necessity. They take up a certain amount of valuable space in the turret, which tends to increase the congestion already existing. They are not entirely flame proof under all conditions, as openings must be provided for access and transfer of ammunition in case of breakdown, where one gun has to be served from the hoists of another. These disadvantages are incurred for the advantage of additional safety and also to meet the requirements of all the Departmental Turret Board reports, and to prevent demoralization of personnel in action, which is believed to be a necessity for service of guns in battle. A great advantage from a structural point of view is also obtained in the case of the separate slide design by the fact that the roof of the turret can be well supported. This increases the protective efficiency of this type of turret, as the roof derives considerable support from the bulkheads and stanchions which can be installed.

In the case of a hit on the turret front plate, the port clearances are necessarily so small that a fragment might easily jam the single slide. One possible advantage to the triple slide type might be derived from having the sight line come out through the side plate of the turret, whereas in the case of the guns separately mounted the sighting arrangements are provided through the lower part of the gun port. This is a doubtful advantage, however, as movement of the front plate would probably entail a certain displacement of the side plating with the result that the trunnion types of sight might well be placed out of action. When the question of sealing the gun ports to keep out water and protect the lenses of sights from spray is considered, the trunnion type of sight on the triple slide possesses considerable advantage over the other arrangement. In the case of a rammer jamming in a gun, it is evident that the separate slide type of mounting is superior, since the fire of the other guns would not be affected unless the elevating gear is cross-connected, in which case the clutches and other devices for cross connection would have to be thrown to operate the guns individually.

The reasons leading to the adoption of the separate slide may be summarized as follows:

It is self-evident that the chances of victory in battle lie with that side whose armor and armament is so disposed as to enable it to inflict the maximum damage upon its adversary, and, at the same time, minimize the damage it receives itself. This broad principal demands that each gun shall be so mounted as to enable it to deliver throughout the battle, the most rapid, accurate and uninterrupted fire possible; moreover, it further demands that the armor protection be so disposed as to reduce the effects of hostile hits to a minimum and to restrict such damage as may be unavoidable to the immediate vicinity of the hostile hit. It is evident that to mount guns in such a manner that the rapidity, accuracy, or duration of fire of one gun is in any way dependent upon the operation or condition of adjacent guns is a violation of this fundamental principle that cannot be justified upon grounds of simplicity, compactness or target practice results.

It is not difficult to imagine many ways in which one well-placed hit could totally disable a single slide turret, nor is it difficult to imagine many casualties of a minor nature, in themselves, that would more or less seriously affect the volume of fire. The fire of three guns is entirely dependent upon one elevating screw and its accessory mechanisms. The jamming of one gun, even by a shell fragment lodged in a port opening, interrupts the fire of all three guns; the failure of one gun to return to battery, or a jammed rammer will cause a similar interruption of the fiber of all three guns. With the three guns mounted in separate slides, a minor casualty will affect the fire of only one gun and it is difficult to imagine a hit so well placed as to disable more than one or possibly two guns.

The curve of total trunnion pressures for a three-gun turret, using guns from 12-inch to 18-inch caliber, takes the form of a hyperbola which has a considerable shoot upward beyond the point corresponding to a caliber of 16-inch. This shows that the advantage gained begins to drop off rapidly beyond this point, since the necessary strength required to hold the gun in the ship involves a corresponding rapid increase in size and weight of turret. Also, the handling appliances for the ammunition increase rapidly in size, and capacity, thus requiring more space for their installation and further decreasing the relative advantage obtained in mounting three guns in a turret.

The above discussion points most forcibly to the great necessity of simplicity and ruggedness in turret designs. The mental and moral strain of battle reduces the ability of the personnel much more, (when cool headedness and careful training in the intricacies of turret machinery are required), than is the case when simple duties are to be performed which do not require care, knowledge and good judgment on their part. At best, turret

machinery must be more or less complicated to perform the various services required. In its simplest form it will tax the brains of the average man, and if he is taxed beyond his capacity, then disaster is sure to follow.

The preceding discussion shows the conflicting requirements to be met in turret design, and the ever-present conflict between operational simplicity and numerous demands for alternative systems, the resulting plans being as usual the best possible compromise after assigning the proper weight to all the various factors considered.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SPEEDING UP COMMUNICATIONS

By LIEUT. COMMANDER M. S. TISDALE, U. S. Navy

The recent cruise of the fleets has undoubtedly convinced everyone in any way connected with communications, or dependent upon them, that the efficiency of present-day communications is almost a direct variable of the speed of handling traffic *within* the ship. A great deal of attention has been given to ship to ship traffic, and the routing systems within the ships are thorough as regards keeping of accurate records, and fairly satisfactory as regards eventual delivery. But there is too much lost motion in getting the received dispatch to the acting authority.

To obviate this slowness the following simple system has proved satisfactory.

The receiving station, whether bridge or radio room, copies the message in triplicate when it is being received. Two of these *rough* copies are sent to the communication office as soon as the sender has signed off. The receiving signalman or operator notes the time of receipt on the rough copy by the letter "TOR" followed by a time group. Upon delivery to the communication office the yeoman on watch on the desk notes the receiving data on his communication sheet, places the office time of receipt (OTOR) on the rough copy and sends it immediately to the duty officer. The duty officer indicates what time it was given to him by a time group after the letters "DTOR." If the subject matter is urgent the duty officer causes action to be taken at once without further red tape. If not urgent he indicates that the message is to be written up for routing to officers concerned, or that it is to be filed without being written up, depending on the context.

This scheme gives a complete record on the rough copy of each message. If any undue delay occurred it is simple to fix the responsibility and to take the necessary steps to prevent a recurrence.

Each night, the yeoman having the mid watch compiles the data from the messages of the preceding day and has it ready for examination and—if necessary—investigation by the communication officer or a designated assistant the next morning. The delay between TOR and DTOR is averaged each day and transferred to a curve of routing efficiency. This shows at a glance the general progress that is being made in improving the speed of communications within the ship. The work involved is small, the results considerable. Each element in the traffic chain knows that if he errs it will be known the following morning at the latest. This causes a corresponding effort to avoid mistakes and delays.

Clocks in receiving stations and in the communication office must be set daily and the duty officer must see that his watch is in agreement with the clock in the office; otherwise the check is of no value.

Any tendency on the part of personnel to "fake" a little on their times noted will be quickly discovered; unless the whole chain decides to fake at the same time. No difficulty has been experienced in this regard.

The following curve shows the efficacy of this system. It was decided to use this system on February 17 of this year. On that date the average delay was over 32 minutes. It seems reasonable to believe that that was the usual delay prior to starting the check. In other words, the usual delay in getting a message from the bridge to the acting authority was some half hour. Allow another half hour for getting the reply back through the same channel, plus whatever time it took to prepare the answer and you get a perspective of some of the reason for the slowness of our communications. There will be occasional bad days with any system but this checking insures fewer of them in that it shows when they occur and allows steps to be taken to reduce them to a reasonable minimum. The average has now dropped from 32 minutes to a little over 8 for the entire month of April, and the majority of the later days have been in the neighborhood of 6 minutes. The lowest spot on the curve is 2¾ minutes. At present it is impossible to maintain that pace for a monthly average but it at least is a good target; and 8 minutes is better than 32.

The checking is automatic and the labor involved in not noticeable. The benefit is sure.

U. S. NAVAL MESSAGE

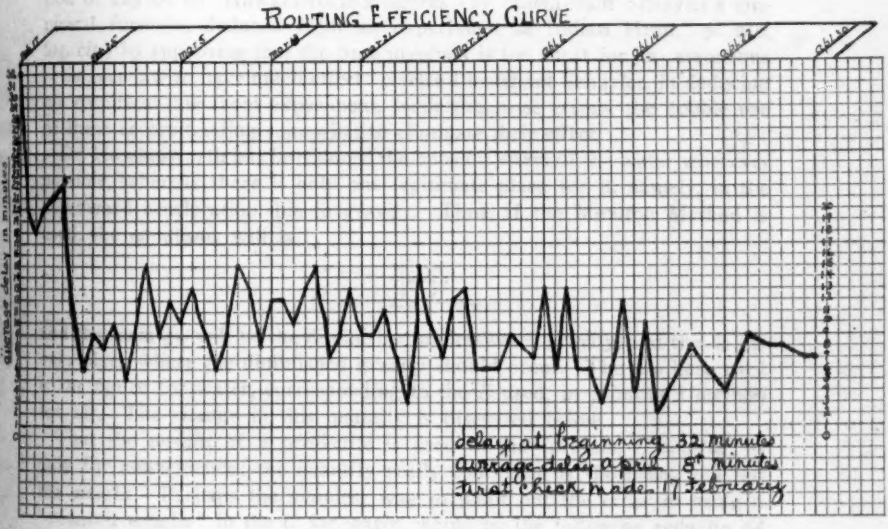
TOR 1648
OTOR 1650
DTOR 1652 M.RB(Do)

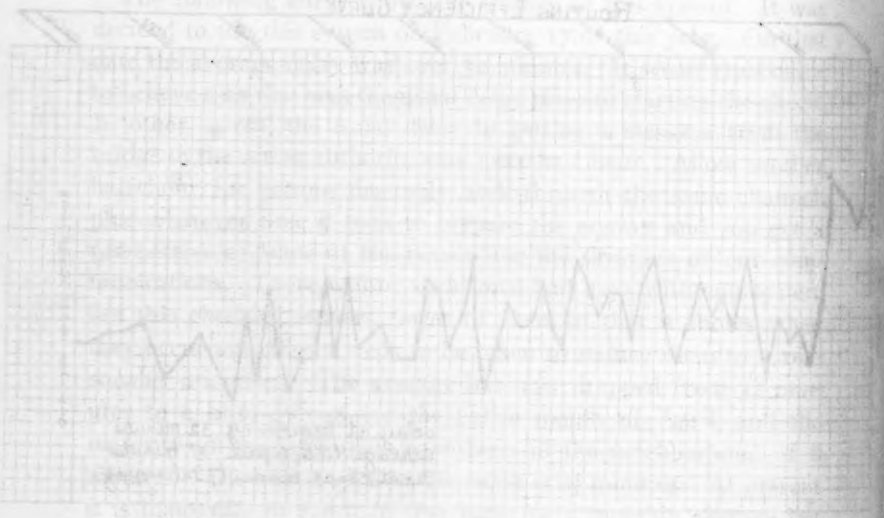
DELAY SHEET Apl 28, 1921

ORIGIN	OFFICE No.	REF No	TOR	OTOR	DTOR	DELAY
CBF	2028	1622	1648	1650	1652	2

4
3
3.+
AVE
U.S. Navy

ROUTING EFFICIENCY CURVE





DISCUSSION

Under-Water Trajectories

SEE PAGE 207, WHOLE NO. 216)

J. J. ARNAUD, Master Computer, Ordnance Department, U. S. Army.—Having recently been required to compute for the Ordnance Department, U. S. A., the time required for drop bombs, striking the surface of the water with a given velocity, to penetrate to various depths, the present writer investigated the article on "Under-Water Trajectories," by Dr. Alan S. Hawkesworth, Bureau of Ordnance, Navy; published in the U. S. NAVAL INSTITUTE PROCEEDINGS, February, 1921.

Certain manifest errors in theory in that article compelled the discarding of Dr. Hawkesworth's methods. In the various trials that followed, it was found that, for the small depth of water penetration used, a *very* large change in the ballistic coefficient produced *very* little change in the time to penetrate. The present writer can only account for the apparent verification of any of Dr. Hawkesworth's figures (by "Lieutenant Schuyler's empirical formula, deduced from an experiment at Indian Head," p. 210, *loc. cit.*) by supposing that the time involved is too short for an erroneous resistance law to have much effect: or else Lieutenant Schuyler, in deducing his empirical law from experiment, made the same errors, the double use of these errors tending somewhat to eliminate their effect.

Dr. Hawkesworth has introduced the buoyant effect of the water wherever possible, whereas there is only one legitimate place for it, namely, in the downward acceleration due to gravity. Thus, if the Moulton Method is used, the equations will be:

$$x'' = -E_w X',$$
$$y'' = -E_w y' - g_w,$$

and the term g_w will be the diminished under-water gravity, and this is the *only* place where the diminished gravity should occur. The E_w here used is the figure for water, corresponding to the E used, in Moulton's method for air. The change in this quantity is discussed below.

That the *weight* of a projectile is used in the formula, $C = w/id^2$, is only for convenience; the quantity really concerned is the mass, and not the weight. Perhaps the simplest way to point out the error in using a "reduced weight" in the C for water, would be the following *reductio ad absurdum*: Computing the C for a hollow shell whose weight in *vacuo* equals the weight of an equal volume of water, we should find, by Dr. Hawkesworth's method, $C = 0$. Such a shell, if projected into water at any velocity however great, would be instantaneously stopped. It is beyond the

present writer to say what would happen to a shell whose specific gravity is *less* than that of water, since one whose specific gravity *equals* that of water would be unable to penetrate an inch!

Dr. Hawkesworth states (p. 212), that, in companion graphs of resistance in air and in water, "those in water, would be 'telescoped' down, with ordinates only 1/925 times the size of those in air. Nor need we be concerned here about the breaks or 'stop points' in Mayevski's function, nor even consider the change of retardation at the critical point of the velocity of sound in the medium—in this case in water—since the flattening of our graph is so excessive, being but 1/925 of its previous air value, that any and all such influences are practically negligible."

Dr. Hawkesworth here forgets that it is the *ballistic coefficient, C*, which he reduces to 1/925 of its air value; and that C enters into the *denominator* of the value of R. Hence any such reduction in C would *magnify* all ordinates by 925, and would therefore make any breaks, such as the Mayevski points, or the "kink" in the Moulton R/v^2 near the velocity of sound, of *enormous* importance. The valid reason for the non-existence of any kink in the water-resistance has escaped his notice. He fails to note that the higher velocity of sound in water (about 4 times that in air) would move any such "kinks" beyond the velocity acquired by our projectiles at present. Or further, that, since water is only slightly compressible, no wave of very great condensation will precede a projectile traveling through water, as does occur in air; and that therefore a graph of the true R/v^2 for water will show only a hardly appreciable kink near the velocity of sound *in water*.

Dr. Hawkesworth nowhere takes account of viscosity. It is certain that this consideration will materially alter the resistance. Indications are that, when the relative viscosities of air and water are considered, and the functions, $B = R/\rho v^2$, ρ being density, are tabulated both for air and for water, the B for a given velocity in water will be equal to the B for about ten times that velocity in air. This appears to be verified only for low velocities.

The subject is now being investigated by the Technical Staff of the Ordnance Department, U. S. A., and in the absence of perfect information, empirical tables are being constructed using the square law, $R = av^2$ the a being so taken that the air ballistic coefficient may be used. Experiment seems to indicate that the square law is approximately correct throughout, but any variations in any particular region can be taken up in the pseudo-constant, a. Accordingly, the tables under construction give to argument, v, the values of $a = R/v^2$. These will only approximate the true resistance, but, as before stated, for short trajectories, the results will be within the allowable limit of error. A few minor errors in Dr. Hawkesworth's article such as calling w_1/W the specific gravity (middle of p. 208), may be passed over without mention.

Reply to Mr. J. J. Arnaud's Criticism of "Under-Water Trajectories"

ALAN S. HAWKESWORTH, F. R. S. A.—My paper was on the loss of velocities suffered by armor piercing projectiles, entering the water at high

velocities of around 2000 ft./sec.; so that your complaint that the equations were not in a form, suitable to obtain the few feet per second travel of bombs dropped in water, is surely confusing two widely different problems. Take the quite parallel conditions in air; you would hardly demand that a 3000 ft./sec. range table should give you the path of a bomb dropped from an aeroplane?

A paper now in the hands of the "U. S. Naval Institute" correctly gives the equations of bodies falling through any resisting medium, air, water, or any other. Wherein I show that, assuming, for the moderate velocities of fall, the resistance of the given medium is proportionate to the square of the velocity; or $R = kV^2$; with k as a determinable constant of resistance; W the weight in pounds of the falling body; g the gravity coefficient in ft./sec.^{2}; while V is the velocity in ft./sec. attained in falling through S feet in an elapsed time t seconds; then

$$V = \sqrt{\frac{W}{k}} \tan hgt \sqrt{\frac{k}{W}} \quad \text{And } S = \frac{W}{kg} \log_e \cos hgt \sqrt{\frac{k}{W}}.$$

From which it follows that as the time t increases without limit; so also must cos h, and the space fallen through. But tan h approaches unity; and the velocity similarly asymptotically approaches a limiting velocity of $\sqrt{\frac{W}{k}}$; fixed for the given falling body, and the resisting medium.

In your criticism that I should have used mass in place of weight, your thought has stopped half way. The only conception we have of "mass," which we conceive as unalterable, is weight divided by gravity; these two latter being alterable in the same ratio; and indeed being two ways of conceiving the same earth attractions. A body in water or air, or any medium, which displaced its own weight of that medium; while it would have the same mass as before; would yet have zero weight; and zero gravitational attraction. So that it could not fall at all.

And this consideration also answers your "reductio ad absurdum." The ballistic equations of Siacci, Ingalls, Moulton, etc., are not designed to solve problems dealing with either infinite or zero weights, in air, or in water. Anymore than one could reasonably ask them to solve the negative weight problems connected with balloons.

With regards to the breaks in the Mayevski functions; if one plots these, one obtains a series of quite disconnected and different curves. And for air resistance, the said discontinuities are quite serious; but are carefully smoothed out, in the calculated tables of Ingalls, and Alger, etc. But for water, the ordinates of the stated resistance graph are but .001 of those in air; so that the said discontinuities become negligible. Your statement that the break at the velocity of sound [with an implication that this is the only break] would be "greatly exaggerated" in water is thus the opposite to the fact; and is merely such a slip as we are all liable to make.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Membership

Life, regular and associate, 5496.
New members, 13. Resignations, 7. Deaths, 3:

Captain A. Crenshaw, U. S. N.
Brig. General J. W. Ruckman, U. S. A.
Mr. C. E. Loud.

Practically the whole service receives the benefit of the PROCEEDINGS yet many officers, who read it monthly, are not members and therefore contribute nothing to the support of the Institute. Members are requested to urge non-members to join. Publication costs are now so high that the Institute is carrying a loss. The cost, per member, however, decreases with an increase in membership.

Dues

The annual dues ($3.00) for the year 1921 are now payable.

Regular and associate members of the U. S. Naval Institute are subjected to the payment of the annual dues until the date of the receipt of their resignation.

Discussions

Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid at one-half the rate for original articles, or about $2.25 a page.

Address of Members

To insure the delivery of the PROCEEDINGS and other communications from the U. S. Naval Institute, it is essential that members and subscribers notify the Secretary and Treasurer of every change of address, without delay.

Book Department

The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

The Boat Book, 1920, and the Landing Force and Small Arms Instructions, 1920, are now ready for issue. The price of the former is 50 cents per copy, and of the latter $1.00 per copy.

In the latter part of the summer, the Institute will publish two books, bearing the following titles: "The Aircraft Hand Book," by Lieutenant Albert Tucker (C. C.), U. S. Navy, and "Composition for Naval Officers," by Professors Stevens and Alden, Dept. of English, U. S. Naval Academy.

The prices of these books will be announced later.

The Seaman's Hand Book, containing much valuable information for enlisted men, particularly those of the deck force, has been added to the Institute's publications. This excellent little book is retailed at 65 cents per copy.

Index to Proceedings

The attention of readers of the PROCEEDINGS is invited to the classified analytical index for numbers 101 to 200 inclusive, which is noticed under "Publications." This is a most complete index, which has been prepared at considerable expense in order to make readily available the information contained in both the articles and the notes of these issues. Only a limited number of copies are being printed. Price, bound in cloth, $2.35; bound in paper, $1.85.

Articles

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ANNAPOLIS, MD., August, 1921.

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PROFESSIONAL NOTES

PREPARED BY

COMMANDER F. M. ROBINSON, U. S. NAVY

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FRANCE

FRENCH NAVAL POLICY.—The adoption of the French naval program is an event that calls for more than passing notice. Its significance lies not so much in the actual provision made for augmenting the fleet as in the fact that France, our neighbor and good friend, has at length mapped out a definite line of naval policy based upon definite principles of strategy. Before turning to the program itself we think it proper to remark that this initial step towards the restoration of French sea power will be heartily welcomed by all thoughtful people on this side of the Channel. The insidious attempts of mischief-makers to represent France as the spiritual home of militarism, and to assign to her the menacing rôle which Germany had played for the half century preceding the war, have met with little or no success. Reasonable folk in this country see no objection to France making herself sufficiently powerful by land, sea, and air to discourage would-be aggressors. They perceive, indeed, that French preparedness will be one of the strongest guarantees against a new war in Europe. Nothing would be calculated to give greater encouragement to the German "revanche" fanatics—who apparently include the major part of the German nation—than the spectacle of France neglecting to consolidate the military position which she occupied at the close of the war. The cardinal necessity for the Republic is, of course, an adequate and efficient army behind a favorable frontier. Those desiderata having been attained, France does well to turn her attention to the sea. The war brought home to her the vital importance of keeping open the sea routes. She is not yet wealthy enough to build the great ships that alone are competent to dominate the great ocean spaces, but she hopes, by the judicious expenditure of available funds, to secure her communications in the Mediterranean, which to her is the naval zone of immediate importance.

The salient features of the new program were recently explained by our Paris correspondent. No battleships are to be built, for the simple reason that they are not for the moment within reach of the national purse. It is clear, however, that French naval opinion as a whole remains loyal to the great ship, and would gladly build mastodons were it not

for their prohibitive cost. We gather from comments in the press that had it been deemed absolutely essential to provide a new battle squadron the money would have been found by hook or by crook. That this heroic step has not been taken is due to the circumstance that France has a pre-war dreadnought squadron, which still ensures her a slight superiority in armored units over Italy. Not that there is any occasion for or prospect of real naval rivalry between the two Latin Powers, but it is only natural that French strategists should keep an eye on the progress of naval affairs in Italy, to whom, also, the Mediterranean area is of primary importance. Where France is conspicuously weak is in the small, swift ships and the submersible vessels which are likely to develop their maximum potency in such waters. She has no modern light cruisers, no big flotilla leaders of the latest type, in which high speed is found conjoined with powerful offensive qualities; and her submarine flotilla, though imposing enough on paper, contains but few boats which are up to the high standard established by war experience. These deficiencies will be made good in part by the Guist'hau program, which has passed the Chamber of Deputies by a handsome majority. It authorizes the construction of no fewer than 66 units, not counting the conversion of the ex-battleship *Béarn* into an aircraft-carrier. To the lay mind one ship is much the same as another, and it is therefore not surprising to find the program described in one of our daily papers as "the most sweeping naval project sprung upon the world since the great American bill of 1916."

Nevertheless, the description is absurd. The Guist'hau plan is modest indeed by comparison with the Japanese program which was adopted a year ago, and it is overshadowed by our own estimates for the current year. It authorizes the construction of six armored cruisers, each displacing 8000 tons; twelve 2400-ton leaders or small scouts, the same number of 1400-ton destroyers, and 36 submarines, about equally divided into coastal and long-range types. With the exception of our *Elizabethan* class, the new cruisers will be the largest, fastest, and most heavily armed ships of their type in existence. Details are lacking, but they are credited with a battery of 7.6-inch guns and a speed of at least 33 knots. Although some doubt the wisdom of building cruisers too large and costly to be risked in minor enterprises, yet too weak to fight a heavy ship, the new vessels are certainly a great improvement on last year's design, which was to have displaced only 5200 tons. As regards the big leaders and destroyers, the value of such craft for Mediterranean operations is self-evident. France found herself sorely handicapped during the late war by her shortage of fast sea-worthy destroyers, and evidently does not intend to be caught napping again. There are no sensational features about the submarine program. The largest boats will be approximately equal in size to our *L* class, and forecasts of a huge submersible-cruiser type have not been fulfilled. French experts say that a well-designed boat of 1100 tons can do everything a submarine is meant to do, and that it is sheer extravagance to build larger submarines at the present stage of development. Our experience with the big *K* boats seems to bear out this theory.—*The Naval and Military Record*, 6 July, 1921.

NAVAL TOPICS.—Frenchmen do not trust Germany, and neither will any Englishman trust her who is acquainted with her past history and actual aspirations and possibilities. In a booklet, communicated to the Chamber, M. Rouchon-Mazerat, a high Admiralty official, shows that Bocheland is entitled under the clauses of the Versailles Treaty to commence, within the next few years, eight ships of 10,000 tons and eight of 6000 tons, which, he thinks, will have no point in common with the old *Braunschweig* class, but will be of the ultra-rapid armored cruiser type, and constitute, of course, a deadly danger for France's lines of communications with her colonies. These disquieting views Minister Guist'hau corroborated. With 16 up-to-date commerce-destroyers and, potentially, the first aerial fleet

in the world, Germany will be, a few years hence, even without the help of Bolshevist Russia, in a position to openly tear to shreds the ill-framed Treaty that terminated the war won by Foch and his French and British lieutenants and since lost by ignorant or Utopian politicians.

It is a matter of tradition that "La Grande Marine Anglaise" always occupies a large place in the naval debates of the French Parliament. Despite the tremendous growth of the American fleet (*a fait nouveau* the importance of which is not overlooked), the British Navy remains for Gallic opinion a model and a guide, even when it is indulging in "semi-naval holidays" as it has been doing for the last few years. The partisans of economy and retrenchment, especially those amusing Socialists who are submerging the Chamber under their "naval" verbiage, though voting *par principe* against the Budget de la Marine, have been urging that, since England is openly giving up the "*trident de Neptune*," it is a conclusive proof that the naval weapon has lost its former superlative worth, and, therefore, impoverished France ought to renounce, once for all, any pretension at sea power, and, at the same time, strange to note, they were particularly violent in their denunciation of "*l'impérialisme Anglais*," their sympathy going solely to poor innocent and peaceful Bocheland, to the disgust of the vast majority of the Chamber, which is resolutely pro-British. The Breton député Lebail, after stating that a powerful fleet was necessary to France, "*dans l'interêt de nos alliances*," pointed out with conviction that Great Britain was to-day, and would be to-morrow, the Queen of the Seas, because "*elle jouit d'une situation incomparable qui la fait sans égale*," and she combines superior shipbuilding capabilities and superior quality of personnel. To the député Berthon who was deriding General de Castlenau on account of the "exaggerated" idea the latter had of the war rôle of the Republican Navy, Minister Guist'hau retorted that without the French command of the Mediterranean the great British Armada, with all its power and efficiency, would have been unequal to the task of matching the forces of the Triple Alliance.

Once more the Minister of Marine deplored the scant justice awarded by public opinion to the achievements of the navy. Daily *communiqués* tied public attention to the fare and work of the "*poilus*" and Tommies fighting on French soil, whereas poor Mathurin, nightly and daily, without respite, tossing and fighting on the stormy element in the midst of deadly perils, interested only a few; no *communiqué* for him; and so, in the simple mind of ignorant "*populo*," he was doing nothing. At these unpalatable reminiscences Député Le Bail felt his Breton blood boil, and he gave to the amazed Chamber an account of a day's work by the Brest patrols under the gallant Admiral Schwerer, who usually hoisted his flag in a 50-ton patrol-boat and supervised the convoying of over 100 ships per day in the spring and summer, 1918. He recalled that Brest Arsenal, during the six weeks between March 1 and April 15, 1918, repaired 135,000 tons of Allied and neutral shipping, one thousand workmen being exclusively employed in British ships.

It is certain that the next 8000-ton cruisers of the *Bouvet* class will be extremely remarkable ships, Chief-Constructor Doyère being reputed for original and thorough work. They will be for their size the best armed and most powerfully engined ships in the world, as their motor-power will approximate 100,000 horsepower to ensure a speed of at least 35 knots, which is satisfactory so far as it goes. Still, the launch of the 10,000-ton *Effingham* comes as a timely reminder that it is as well not to claim too much for the *Bouvets*, and not to expect M. Doyère, despite all his inventive genius, to obtain out of 8000 tons as much offensive and defensive qualities as British constructors are getting out of 10,000 tons. The *Effingham* will be slower, but she has good chances to be the best all-round cruiser for robustness, reliability, sea-keeping capacity, and especially for defensive power. And yet M. Denise, a good-intentioned and patriotic *député*

but obviously unprepared for the responsible functions of "*Rapporteur du programme naval*," hoped and prayed for a reduction of the projected displacement from 8000 to 7500 tons, little aware of the insurmountable difficulties he was thus placing in the way of those whose ambitions and efforts aim at giving France, in the cruiser line, the superiority for quality which is alone worth investing in. Number without individual superior strength is little more than make-believe, as the Boches have learned to their cost, and it would be wiser to build five cruisers of 10,000 or 11,000 tons, capable of mounting heavy calibers and of outclassing all rivals, rather than six 8000-ton *croiseurs légers* that will be merely equal, if not inferior, to rivals already floating. Moreover, this French practice of compulsory limitation of displacements by incompetent *députés*, who have in view merely the financial side of the shipbuilding question, never worked satisfactorily; it is bound to lead to the sacrifice of essentials. In all battleships and cruisers anterior to the *Jean Bart* type, for instance, the fighting value was depreciated more or less, by the cramped-up condition of the turrets. It is only with 25,000-ton *Normandies* that really roomy, comfortable gun quarters were introduced into the French Service; but, as ill-luck would have it, to no avail, it having been finally decided to condemn the 60 or 70 per cent completed *Normandies*, which thus become so much waste of genius, time, and money (170 million francs for materials alone). Still, if "much can be got out of little" on the lines advocated by M. Harpagon, the bold originator of the *Normandie* type is the likely man to achieve a miracle of that magnitude.

Député Denise referred to the deep-rooted belief that French ships are faster at sea than rivals in other navies with the same paper speed, the reasons being that Gallic constructors make a liberal allowance for motor power, which is true—compare the 23-knot ships *Quinet*, 14,000 tons and 39,803 horsepower; *Minotaur*, 14,800 tons and 28,650 horsepower; the 12,600-ton *Michelet* and *Roma*, the French developing 30,000 horsepower and the Italian only 20,000 horsepower, and yet put down on paper as having the same speed. Think of the *Dante*, which is claimed to do 21 knots with 21,000 horsepower, whereas the *Voltaire*, of similar displacement, requires 29,000 horsepower to maintain the same rate of speed. Besides, it is a fact that trials in the French Navy are far more exacting and more conscientiously supervised than anywhere else. The crossing of the Atlantic at 13.5 knots by the 17-knot *Gaulois*, at 16 knots in rough weather by the *Lepord* division (the 18-knot *Liberté*, *Justice*, and *Vérité*) are performances unique for pre-dreadnoughts.

Still, British speed war records exceed all others, and were the source of the success of the dashing *Beatty* and of the tenacious *Sturdee*. Some French ships also did very well, and Austrian cruisers, though nominally much faster, had several times to thank the proximity of Cattaro for their timely escape from the deadly grip of the reliable *Quinets*. At the same time, a few turbine battleships gave some trouble. At the outset of the hostilities, for instance, the *Mirabeau* (18,500 tons, 19.73 knots on trial) refused to exceed 15 knots, despite much coaxing. The sea speed of ships has little to do with the nominal figures carefully noted in naval pocket-books; neither can the motor power be altogether accepted as a true criterion of speed. Experience shows the speed problem to be extremely complicated. Once there was a race, from Toulon to Indo-China, between the 14-knot battleship *Redoubtable* and the 20-knot 4000-ton cruiser *Chasseloup-Laubat*, and the slow but robust and roomy battleship won easily. Again, the 24-knot *croiseurs-corsaires Chateau Renault* and *Guichen* caused enthusiasm when running on their trials, but later gave rise to bitter disappointment. Robustness, good fuel, and trained personnel are what matters most.—*The Naval and Military Record*, 6 July, 1921.

SAFE COMMUNICATIONS.—For the first time since the armistice, the French Navy has carried out—though with skeleton battle squadrons and

flotillas—tactical exercises on something like realistic lines, and having for theme a vital problem of sea warfare; and it is remarkable that the Atlantic, and not the Mediterranean, witnessed that interesting preliminary contest in which took a part the 24,000-ton *Bretagne* and *Provence* (the *France* having temporarily quitted the Fleet for Constantinople), two dozen destroyers and submersibles, and as many aerial craft, from Rochefort and Lorient. Though the combatants were few, the action spread over a pretty large area, off the Loire estuary, Belle-Ile, and Quiberon, and lasted some 50 hours, being marked by surprises, instructive incidents, and no less instructive accidents.

Of course, with so small, and in some respects inadequate, a force it would have been pretentious to try and give a mimic representation of the great objective problems of to-morrow, and officially Admiral Salaun's modest ambition was to provide for his crews "*un exercice de recherche, d'attaque et de défense*," as well as to test the conditions of training and the radius of action of the coastal flotillas, the latter question being of special interest at the moment when the whole "*défense des côtes*" organization is being reconsidered and revised by Admiralty authorities. But, in reality, things passed off just as if a hostile force en route from the Mediterranean for the Channel (or the reverse) were being intercepted by French Atlantic flotillas; thus a study of the problem of safe communications that governs sea warfare. Admiral Salaun's game was to pass, leaving as few feathers as possible in the hands of his assailants who had to find him, lay ambushes across his route, attack him both from the air and from under water, pursue and harass him through the night, and bring him to grief by all means. Had the game developed as it would have done under war conditions, the battleships keeping well off to sea and using the recent devices to conceal their course, no contact and no combat would have taken place. The admiral had to lend an obliging hand to his puny antagonists and to go some way to meet them. Despite this fact and the exceptionally favorable weather, coastal seaplanes and dirigibles practically failed in their scouting mission, and were *hors de combat* before the concluding phase of the hostilities.

Thus came a timely lesson (coming after the Cherbourg and Mediterranean experiments) that can only spur the energetic Minister of Marine to action. Dashing and even enterprising aviators the Marine Française possesses in pretty large numbers; a practical aerial policy, a program *d'ensemble* framed by practical men, and a reliable robust type of "*hydravion autonome*" for independent oversea cruising are the urgent desiderata of to-morrow. It is only when such projects have become reality and the Guist'hau program has been constructed that the Gallic Navy will be in a position to control the Bay of Biscay routes and to spread out a few hundred miles at sea the offensive radius of action of the Brittany coastal flotillas, for the question of safe communications is primarily one of speed and range.

Of course, it would be a negative policy for France to limit her naval ambitions to the cutting or control of Atlantic and Mediterranean Sea routes by means of offensively equipped strategic points *d'appui*. As the war has shown, she is, just as much as England is, in need of safe oversea communications to enable her lasting out and ultimately winning in the coming conflict for which revengeful Bocheland is secretly preparing. Once she has been isolated from her vast colonial Empire, France is merely a nation of 38,000,000 people confronted by one of some 70,000,000, with superior industrial capabilities, and it must not be forgotten that disarmament, even if it were real (which is very far from being true), does not mean Boche powerlessness when the sole Spandau arsenal, with its plant and reserve of materials unique in Europe, is in a position to turn out in a few months the armament of a huge army in guns and machine guns. France would thus have reasons to welcome the British proposal to limit, by an international arrangement, the rôle of submarines, and, especially, to

absolutely forbid piracy on Boche lines. In 1918-19 on the morrow of the armistice, the bulk of the French naval opinion was with England on the matter, and Constructor Laubeuf, writing in *Le Yacht*, and while strongly asserting the right and intention of France to keep on building submarines, stigmatized the Boche pirates and their barbarous methods of warfare. France felt then sure that stern chastisement would be meted out to the cowardly murderers of the sea and of the land, as proclaimed by the British Premier; and, of course, that grand act of justice would have served as *"un exemple"* for centuries to come, and deterred would-be baby-killers better than any international arrangement on paper can ever do.

Since then, unfortunately, Frenchmen have had their eyes opened to unpalatable reality by the negative support the Allies are giving to their claims for reparations and by the Leipzig comedy. They have learnt that sentiment and generosity do not pay, and with bitter regret they remember the many but useless proofs of pacifism, humanity, and disinterestedness which they have given to the world, viz.: Premier Viviani's withdrawing French troops ten kilometers from the German frontier; Messimy, War Minister, refusing Professor Turpin's deadly inventions on a plea of humanity; the terrible Vincennite gas poison being delayed in use for like motives, etc., and to crown all, Premier Clemenceau accepting a promise of permanent alliance with England and America as a substitute for the immediate financial and territorial reparations which he had the power to enforce, and allowing the defeated Boche army to preserve its armament instead of dealing with it as was done to the fleet, in the sensible British way—with the result that "innocent" Germany is to-day being pitied and "imperialistic" France being denounced!

No wonder the French national sentiment should have got exasperated. Since striking force and *"capacité de nuire"* are the only things that count and the only solid foundations for the national security, sentimentally inclined France must relinquish her generous feelings and renounce no weapon of offense, all the more so as she is more than able to hold her own in the "savant" and scientific warfare of to-morrow. France has lost through the savage mode of warfare inaugurated by the Boche more innocent victims (children and women) than all the Allies put together; her population has diminished by 2,200,000 (recent census). Torpedoes and aerial bombs will less and less discriminate between non-combatants and bona-fide belligerents; chemical warfare will work extermination over massed, dense centers of population. What is submarine piracy compared with this frightful outlook? France is for the suppression of war, but if war is forced upon her, she may be trusted not to lag behind in the use of the most terrible weapons.

It is no secret, as the successive *Rapporteurs du Budget de la Marine* have published full particulars about it, that up to quite recently the *"artillerie de côtes"* only included obsolete 9.4-inch guns with a range of about 9000 yards. German battle-cruisers, but for the English fleet, could have bombarded Cherbourg and other Channel ports with impunity so far as the coastal artillery was concerned. A new armament of 12 and 13.4 inches will henceforth arm the most important points along the French coast, and, as the Türingen experiments show, the firing efficiency at extreme range (18,000-24,000 meters), with aerial control, will be adequate against the most powerful battleships, pending the completion of the 18-inch and super-cannon batteries that are in preparation. These efficient coastal batteries, combined with aerial and mining organizations, will prove sufficient to keep a prudent enemy at a respectable distance from the French coast. The chances of safe landing which the Boches had in 1914 they will never find again. But *"défense des côtes"* nowadays means very much more; it means for France, by virtue of her geographical situation, the control of the most important European sea routes. This strategic advantage, in these days of long-range submarines and seaplanes, Great Britain is alone to share with France.—*The Naval and Military Record*, 20 July, 1921.

THE STATE OWNED FLEET.—The liquidation of the merchant fleet owned by the State is still under discussion, and another report has been drawn up for the Commission of the Merchant Marine by M. Morinaud, who is perhaps more severe in his judgments upon the incompetence of the State as a shipowner than his predecessors. M. Morinaud experienced great difficulty in finding out what the State working of the fleet cost the country, for accounts were practically non-existent, but he ascertained that the loss up to the end of February last had exceeded 550 million francs, and that, too, during a period when freights were extremely high. In a previous report it was learned that the losses had continued at the rate of a million francs a day, although it is understood that considerable economics have been carried out since. The government was urged to get rid of the fleet at the beginning of the present year, and had it done so the operation would have been carried out under fairly satisfactory conditions.—*The Engineer,* 1 July, 1921.

GERMANY

THE GERMAN NAVY.—The semi-official *Marine Rundschau* has furnished some interesting particulars of the manner in which Germany intends to employ the small naval force allowed her by the Peace Treaty. She has now, it may be recalled, six battleships, six light cruisers, twelve destroyers and two torpedo-boats, but no submarines. This force is equally divided between the North Sea and Baltic, in spite of the fact that the *Rundschau* says that the pressure is no longer in the North Sea but in the Baltic, "where the situation created by the separation of the province of East Prussia draws the fleet to the East, and the flag must be shown to those Germans who have been cut off from the Fatherland, and in relation to whom difficulties may yet arise." In the North Sea there will be the battleships *Braunschweig* (flag), *Elsass* and *Schlesien;* the cruisers *Hamburg, Arcona* and *Amazone;* and the second flotilla of six destroyers and six torpedo-boats. In the Baltic there will be the battleships *Hannover, Hessen* and *Schleswig-Holstein* (the last two to join later), the cruisers *Medusa, Thetis* and *Berlin,* and the first flotilla. Most interesting of all in one sense is the news that a 6000-ton cruiser is building or about to be built at Wilhelmshaven. Germany may be a third-rate naval Power, but she is evidently determined to be a very efficient one all the same.—*Army and Navy Gazette,* 23 July, 1921.

GERMANS BUY SWEDISH SHIPS.—Germany, taking advantage of the world lull in shipping business and while European harbors are congested with idle crafts, will seek to rebuild her merchant marine, by buying or leasing trade ships from owners of merchant fleets in the Scandinavian countries.

The Department of Commerce was advised yesterday of Germany's plans to take over several Swedish ships, in a cablegram from American trade commissioner Klath, at Copenhagen. Commissioner Klath's message gave no detail of Germany's plan, but officials assumed that Germany now expects to secure a price advantage by purchases at this time.

The shipping situation in most of the principal European countries continues much depressed, according to cablegrams to the Department of Commerce. Officials said there may be significance in reports from Great Britain that improvements in shipping rates give promise of larger business in the future.—*The Washington Post,* 8 August, 1921.

GERMAN SHIPBUILDING.—Reports just to hand from Germany indicate a marked revival in the shipbuilding industry. It is true that the obligation to build 200,000 tons a year for Allied Powers, as laid down in the Peace Treaty, is a handicap, but in view of the plethora of shipping, it is becoming a question whether the Allies will wish to insist on the fulfilment of this obligation. The total capital now invested in twenty-six of the principal shipbuilding companies is, according to a return published in *Schiffahrt-Zeitung,* 230,000,000 marks, loan and mortgages total 61,000,000

marks, and reserve funds 52,000,000 marks. The process of amalgamation with the shipyards and the steel trades is not yet concluded, and this policy is regarded as opening up a prospect of simplifying, cheapening and hastening the system of series building which German shipyards have adopted for practical, as well as economical reasons.—*The Engineer*, 1 July, 1921.

FIRST GERMAN CONCRETE SHIP.—The first concrete ship built for the new German mercantile marine has been named the *Gotaalf*. She is 118 feet long, 28 feet beam and has a depth of 15 feet. She is of 800 tons deadweight and 1300 tons displacement.—*Nautical Gazette*, 30 July, 1921.

GERMAN ENGINEERING COMBINE.—Fusion of engineering interests in Germany continues. It is announced that the Dusseldorf Machine Works, which are now being re-organized with a view to undertaking the construction of locomotives and rolling stock, is to be amalgamated to a certain extent with the A. E. G., Krupps, Lincke-Hoffmann, and other well-known engineering enterprises. With the object of facilitating export trade, the Wolff interests, whose headquarters are at Cologne, will be included in the new combine.—*The Engineer*, 22 July, 1921.

GERMANY.—A new use for the many unfinished submarines which Germany had left on her hands at the close of the war has been discovered by the Germania Yard at Kiel. This yard has just launched two oil tankers, the *Ostpreussen* and *Oberschlesien*, for Herr Hugo Stinnes, both of which were fabricated from the discarded hulls of U-cruisers. The method of constructing the *Ostpreussen*—as described in *Schiffbau*—was to take two of the pressure hulls and join them together in parallel, fitting bow and stern sections to maintain a ship-shape form, and building a superstructure upon the double-hulled vessel thus evolved. Each pressure hull had a maximum diameter of 5.75 meters and a length of 77 meters, the dimensions of the completed ship being as follows: Length over all, 87.4 meters; extreme breadth, 12.3 meters; moulded depth, 7.6 meters; dead-weight capacity, 3000 tons. The ship is propelled by two Diesel engines, originally built for a submarine, but altered to less power and a lower consumption of oil. As modified, each engine develops 700 brake horsepower, and the collective drive of 1400 brake horsepower gives the ship a speed of 10 knots. This method of construction has much to commend it, especially for oil tankers, as submarine hulls possess an uncommonly high degree of water and oil tightness. The *Oberschlesien* was built in precisely the same way, and it is expected that further oil tankers will be ordered after the same pattern.

In May last an American paper published a dispatch from its Berlin correspondent purporting to disclose the "secret" of the destruction of H. M. S. *Hampshire* with Lord Kitchener on board. The story went that on May 29, 1916, the German submarine *W-75*, Commander Kurt Veitzen, had laid 34 mines in the vicinity. Four days later—*i. e.*, three days before the *Hampshire* was lost—a mine-sweeper came to grief in this field. This information either failed to reach Admiral Jellicoe or was overlooked by him in the confusion consequent upon the action off Jutland, for he ordered the *Hampshire* to steer a course west of the Orkneys, in the assumption that no German U-boat had been operating so far north. The latter part of this story is practically confirmed by Lord Jellicoe ("The Grand Fleet," pp. 423-424), but the Berlin correspondent has been wrongly informed as to the identity of the boat. The fatal mines were laid by *U-80*, belonging to the first group of ocean-going submersible mine layers built in Germany. These craft—which must not be confused with the small UC mine layers designed for coastal work, though subsequently developed into a sea-going type—were ten in number, *U 71-80*. They displaced 755 tons and had a cruising radius of 8000 miles at 7 knots. The armament consisted of two torpedo-tubes, one 4.1-inch gun and 38 mines, which were expelled

from tubes at the stern. The type was considered rather a failure owing to the low surface speed of 10½ knots. *U-80* herself was a lucky boat. She was in service for two years and nine months, during which she is said to have planted upwards of 500 mines in British waters, and in spite of many narrow escapes she survived the war, being among those surrendered to the Allies. A sister boat, ex-*U-79*, is now under the French flag as the *Victor Réveille.—The Naval and Military Record*, 6 July, 1921.

SUNK HOSPITAL SHIP.—Leipzig.—The trial opened to-day before the Supreme Court of the submarine Lieutenants Boldt and Dittmar, in connection with the sinking of the hospital ship *Llandovery Castle*, and the firing at open boats.

The indictment alleged that Commander Patzig (who disappeared when he was listed for trial), after the ship had been torpedoed, ordered the crew below, and, with the two lieutenants, remained on deck and fired on the life-boats.

Boldt and Dittmar were first cross-examined, but declined to say if their superior officer had recognized the *Llandovery Castle* as a hospital ship. They both denied the charges.

An officer of the torpedoed ship named Chapman said that failure to recognize it would be impossible. He admitted that the ship was going to Liverpool, and did not sail on the route allowed by the German Government.

Witness graphically described the sinking of the vessel. All the lights failed, and the wireless apparatus was put out of order by the first torpedo. All the boats were got off successfully. The boat in which he was answered signals from the submarine, which approached them and nearly ran them down. The commander, with a revolver in each hand, ordered him aboard the submarine, where he gave proofs that the attacked vessel was merely a hospital ship. He was then sent back to his boat, which the submarine again nearly rammed. The commander fired two revolver shots and the submarine fourteen shots over the boat, which escaped.

At the second day's hearing of the *Llandovery Castle* case, in which Lieutenants Dittmar and Boldt are being tried on charges of shooting at survivors of the hospital ship, Walter Popitz, a petty officer belonging to *U-boat 86*, which sank the ship, was called to give evidence.

He described how the *Llandovery Castle* was sighted and how she was bearing the regulation lights for hospital ships. He said the submarine followed her, as they always suspected hospital ships, especially as they were a danger to submarines, adding: "We knew from German newspapers that the English abused hospital ships."

In answer to a question by the president witness said there was nothing suspicious about this ship. The prisoner Dittmar and he (the witness) tried to persuade Lieutenant Patzig, the commander of the submarine, who has absconded, not to attack the *Llandovery Castle*, Patzig not being an autocratic man, and being always willing to discuss things.

Popitz went on to say that the submarine dived and fired two torpedoes, and then came to the surface and waited to see if there was anything about this particular ship to justify their suspicions of the abusive use of hospital ships.

At this point the president asked Popitz why the submarine did not try to investigate before attacking.

Witness replied that was impossible. He saw three or four life-boats with people on board and several men swimming in the water, as though some boats had capsized. Witness then went below. Directly afterwards all the crew were ordered to go below and stay there. There was a general feeling that something unfortunate had occurred. Half an hour afterwards, Popitz deposed, they heard firing, and formed the impression at the time that life-boats were being fired at. So far as he knew, there was no enemy ship in the neighborhood.

The president asked witness whether the second explosion they heard on the *Llandovery Castle* sounded like munitions.

Popitz answered: No. It was the boilers exploding.

Two days later, said Popitz, Patzig called the crew together and said: "Whatever has happened I take on my conscience before God, and I want you to say nothing about it."

On prisoner's counsel asking a question about Petty Officer Meissener, the president interposed, remarking that Meissener was dead and could not be brought into the case.

Counsel persisted in his inquiry about Meissener, whereupon the president became angry, and said, "I don't think a dead man will be held responsible."

In answer to questions, Popitz said it was early when the *Llandovery Castle* was first sighted, and they followed her for several hours, and at dusk it was noticed that she was lighted like a hospital ship. She was not taking a zig-zag course.

Popitz on first appearing at the witness stand declared he could not remember anything, but on the president insisting that he must tell what occurred he gave his testimony very clearly.

It is inferred from what Popitz says about all the crew being below when the submarine was firing that the guns must have been manned by Patzig and the prisoners under trial.

Lieutenants Ditmar and Boldt have each been sentenced to four years' imprisonment, but without hard labor, the public prosecutor demanded.

Dittmar and Boldt were charged with murder in the first degree by firing upon life-boats carrying survivors of the British hospital ship *Llandovery Castle* after it had been torpedoed.

This case differed from all previous trials at Leipzig, in that proceedings were taken at the instance of the German prosecutor. The British Government only demanded the trial of the commander of the submarine, Lieutenant Patzig, who has since fled from Germany and is believed to be at Danzig. The public prosecutor, however, asked to have all the British evidence and after examining it he ordered Lieutenants Dittmar and Boldt to be arrested and tried.—*Army and Navy Gazette*, 23 July, 1921.

STIRRING UP STRIFE.—Several German papers, we are told, described Boldt and Dittmar after their conviction as "U-boat heroes." We know now what "hero" signifies to the German mind! This and countless other instances of the shameless, morbidly revengeful spirit which appears to animate the greater part of the German people constitute a warning too serious to be ignored. They are forcing us to regard them as bitter enemies who will lose no opportunity of revenging themselves for the absurdly inadequate penalties they have incurred at our hands. From high to low the same spirit prevails. The "intellectuals" are fed with tirades from the professorial "old gang," who are far more bellicose and loquacious to-day than before the war; while the Anglophobe sentiments of the masses are lavishly catered for by the gutter journals. One result of this organized provocation to mischief was seen at the German port of Geestemünde early this month, when the Grimsby trawler *Keelby*, which had put in to coal, was stoned by a mob, who smashed everything breakable, injured one of the crew, and directly caused the loss of the vessel by compelling the master to navigate her out of the harbor stern first, where she grounded, receiving damage that led to her foundering a few hours later. We assume that more will be heard of this incident, the facts of which we have taken from Lloyd's list of marine casualties. So long as this sort of thing goes on—as go on it will unless the Mad Mullahs of Germany grow weary of preaching the doctrine of hatred—there can be no real peace in Europe. Germany alone can stop the mischief, and thus pave the way to that resumption of normal and not unfriendly relations which it is obviously to her interest to promote. The British are not an unfor-

giving people, and they would be glad enough to see the first symptom of returning sanity among the German people. But they are still looking for it.—*The Naval and Military Record*, 27 July, 1921.

BRITISH AND GERMAN WARSHIP DESIGN.—When the Director of Naval Construction read his "Notes on Some Features of German Warship Construction" at the Institution of Naval Architects last March, and spoke somewhat critically of German designs and naval matériel in general, it was evident to all who know how extremely sensitive to criticism our late enemies are that they would not take this adverse judgment lying down. They have now delivered their counter-attack in the form of a long article published in *Schiffbau* from the pen of Geheimer Oberbaurat Dr. H. Bürkner, formerly chief of the Shipbuilding Division of the Marine-Amt, whose position corresponded, therefore, to that held in England by Sir E. T. d'Eyncourt. Dr. Bürkner shows himself to be an able advocate. His case for the defense is the more convincing because it is put with restraint and courtesy. He takes each paragraph of Sir Eustace's paper and comments upon it, and while his article is far too long for textual reproduction, I propose to deal with his principal points, for he gives us many new and interesting facts about German naval construction.

Sir E. d'Eyncourt observed in his paper that the Germans had the advantage over us of larger docks, which enabled them to build broader ships with greater initial stability. Dr. Bürkner writes: "This disability would certainly have been removed had the British constructors sufficiently emphasized the need of larger docks, for it is inconceivable that the leading naval power would have hesitated to provide such docks, however great the cost, if they had been considered indispensable. As regards Germany, the decision to increase the metacentric height by approximately 100 per cent was taken when the first dreadnoughts (*Nassau* class) were planned. This was a decision the boldness of which Sir Eustace will doubtless appreciate. When he argues that we, owing to our broader docks, had a freer hand than he or his predecessors he overlooks the fact that we on our side were no less handicapped by the shallowness of our coastal waters."

Mr. Goodall, R. C. N. C., who read a paper on the *Baden*, spoke of this vessel as indicating the latest German ideas on battleship design. Dr. Bürkner writes: "The *Baden* was unfortunately the last German capital ship to reach completion, but later designs had been produced, *i. e.*, the *Baden's* improved sisters, *Sachsen* and *Württemberg*, and the battle cruisers of the *Mackensen* and *Ersatz Yorck* classes, armed respectively with 14-inch and 15-inch guns. As Sir Eustace alludes with pride to the *Hood* as the last word in British construction, it would be of interest to compare this ship with the German capital ship design got out in 1917. I am, however, not authorized to give the details necessary for such a comparison.

The *Baden* was not in any case our supreme effort in the development of the battleship type, although war experience did not reveal the necessity of modifying our principles of construction, either fundamentally or in important detail. It is true that after the Battle of Jutland we did not have to carry out in our ships such far-reaching alterations as the British found it expedient to make in theirs.

"Sir Eustace d'Eyncourt refers to the *Baden* as an 'interesting ship,' but adds that she was designed as soon as Germany heard of the *Queen Elizabeth* class, of which she is a 'fairly close but inferior copy.' That is a pure myth. Except in the caliber and disposition of her guns and in the general arrangement of her external armor the *Baden* exemplifies totally different ideas of construction. In point of fact, not even in respect of her artillery can we admit her to be a copy of the *Queen Elizabeth*, for the caliber and arrangement of her guns were approved by the Kaiser on January 6, 1912, after endless discussion, and at that time no news as to the *Queen Elizabeth* had reached Germany beyond the rumor that a heavier

British gun than the 13.5-inch was contemplated. Sir Eustace surely does not suppose that we had knowledge of the *Queen Elizabeth's* armament, etc., nine months before she was laid down. The *Baden* class was, in truth, developed out of the *König* class in all essential features except armament, and the latter was decided on in the first days of 1912."

Dr. Bürkner contends, on the other hand, that the armor protection of the *Queen Elizabeth* was modelled after that of the German *Kaiser* class, which had been begun at the end of 1909; and, further, that we adopted German ideas in restoring the 6-inch secondary armament in the *Iron Duke* and later types. He deals next with the statement that the *Baden's* speed is inferior to the *Queen Elizabeth* and her protection inferior to that of the *Royal Sovereign*. As regards protection, he writes: "The *Royal Sovereign* is inferior to the *Baden* in defence above and below water excepting only the 2-inch armor deck in the citadel, and even this deck would offer small resistance to A. P. shell with good delay-action fuses owing to its high position, pronounced slope, and want of coal protection. The corresponding arrangement in the *Baden* consists of a 1.1-inch steel deck, a 1.1-inch and 3-inch splinter bulkhead, and bunkers filled with coal. Sir Eustace mentions that the *Baden* steamed three knots less on trial than the *Queen Elizabeth*, and that she suffers from the drawback of mixed firing. The creation of a fast battleship division had repeatedly been discussed in Germany, and was a pet idea of the Kaiser's but it had been dropped at the time when the *Baden* was designed. Unless we had sacrificed fighting power or increased dimensions beyond the permissible limit it could only have been realized by adopting oil only, and this was objectionable on two grounds—first, because it was impossible to guarantee an adequate oil supply in war time, and, secondly, because coal afforded excellent protection against shellfire, mines, and torpedoes, whereas oil fuel required protection itself. Consequently, we contented ourselves in the *Baden's* case with a speed no higher than that of the preceding *König* class. But what practical value was derived from the *Queen Elizabeth's* margin of speed is shown by Admiral Jellicoe's Jutland dispatch, in which he says: 'The fact that the 5th Battle Squadron (*Queen Elizabeths*) was unable to increase its distance from the German ships (*König* class) when steaming at their utmost speed, comes as an unpleasant surprise.'"

According to Sir E. d' Eyncourt, the *Baden* and most of the more recent German capital ships are subdivided more minutely than the British in some parts, but less so in others, so that the arrangement as a whole does not make for any greater safety in case of accident or flooding than in the British ships. To this Dr. Bürkner remarks that, since the plans of the *Queen Elizabeth* and *Royal Sovereign* are unknown to him, he cannot express an opinion, but, as regards the earlier ships, he is able to give a comparison of the sub-division of the rival types based on plans of the *Emperor of India* and *Princess Royal* which fell into German hands during the war. They are contrasted below with the *König* and *Derfflinger*, ships of corresponding size and date:

Sub-division below the armor deck, given in percentages of total space:

	König	Emp. of India	Derfflinger	P. Royal
Small compartments less than 300 cbm...	75	70	65	49
Medium compartments 300-1000 cbm....	25	7	28	9
Large compartments more than 1000 cbm.	0	23	7	44

The above table shows that the number of small compartments (double bottom, passages, etc.) is practically the same in the British and German ships. While, however, the German ships have many more medium compartments, but practically no large ones, in the British ships the latter occupy from one-quarter to one-half of the total space below water. "This disparity," writes Dr. Bürkner, "is so great that it cannot be brought to harmonize with the lecturer's assertion. A comparison above water would be equally advantageous to the German ships." He adds that if damage

to the armor deck of the *Princess Royal* caused one of the main engine-rooms and its adjoining wing compartments to be flooded the ship would assume a list of 17 degrees, whereas corresponding damage to the *Derfflinger* would produce a heel of only 9½ degrees.—*The Naval and Military Record*, 20 July, 1921.

GREAT BRITAIN

NATIONS AND THEIR NAVIES.—While plans are in process of formulation for an international conference in Washington to consider the question of placing a limitation upon armaments, the British House of Commons has voted approval of the government's plan to construct four battle cruisers, to be completed by 1925. These ships will carry 16-inch guns and will be of the fastest and most powerful type.

It is explained that the addition of these vessels to the British Navy is a replacement of four battleships that are now obsolete. However, the substitution of four ultra-modern battle cruisers, carrying the heaviest armament known, for four out-of-date ships, is more than a replacement. It will amount to a very decided increase in the naval strength of the empire.

The British Government has proposed this addition, and commons has approved it, upon the theory that the vital interests of the nation demand that the navy be maintained as the strongest of any in the world. Officials declare that in view of the building programs of the United States and Japan, this status cannot be held by England without the increment just authorized. In fact, they profess that a much greater addition should be made, and would be made except for a desire to avoid the appearance of inconsistency in entering into competition with other powers for naval supremacy on the eve of the disarmament conference.

Little fault can be found with the determination of the British Government to conserve the vital interests of the empire according to its own lights. On the contrary this is a policy which some members of the American Congress might emulate to advantage. Taking the utterances of English statesmen at par value, they stand ready to co-operate with the United States and other great powers for a limitation of armaments; that is, an agreement first to cease additional construction, and later possibly to reduce existing armaments. They seem to assume that any limitations agreed upon will recognize the proportionate naval strength of the various powers as it exists at the time of the agreement, and that idea appears to be prevalent generally.

Appropriation for continuing the building program of the American Navy were voted over the opposition of a considerable peace faction in Congress, which demanded a cessation of construction in view of the announced intention of the President—supplemented by a formal, though unnecessary, authorization in the naval bill—to inaugurate a movement looking to limitation of armaments. Appeals to this contingent to support the government's policy to keep on with a consistent program, originally adopted in 1916, until an international agreement could be reached, fell upon deaf ears. They insisted that the United States should set an example to the world of its sincerity by slowing up, and there are Representatives and Senators who even now would have the Navy Department stop building operations, although Great Britain and Japan are proceeding to increase the strength of their navies pending the time when a limitation agreement shall be made.

However, it is the opinion of a strong element in this country, and has been since the close of the war, that the long coast line of the United States and the great and growing foreign trade make it imperative that this nation should have a navy second to none in the world. Whether or not it may be regarded as desirable to compete with Great Britain for equality of naval strength, if not for supremacy, every intelligent American is ready

to concede that this country should have a navy adequate to protect its interests under all circumstances. It may be added that many of those who were opposed to a naval increase were at the same time opposed to a reduction of the relative strength of the United States in comparison with England and Japan. The existing status can only be maintained by following a rational policy of additions, such as that just authorized by the House of Commons.

America cannot stand still and do nothing, with England and Japan constructing new ships, unless she sacrifices her position as the second naval power in the world and surrenders all hope of taking or sharing first place. Every keel authorized by Congress should be laid promptly, and work should not be permitted to lag in any respect. Like England, this country should consider her national interests as paramount, and like her, too, America must be the sole judge of those interests. In doing this no American, official or private citizen, need abate any of the ardent hope which he cherishes for the successful outcome of the approaching disarmament conference.—*The Washington Post*, 5 August, 1921.

CAPITAL SHIP DESIGN.—Nothing authoritative is likely to become generally known regarding the design of the capital ships which are to be built for a long time to come. We may, indeed, be permitted to learn general details as to tonnage, guns and speed. But the various new features which it is safe to predict will be embodied in these vessels as the fruits of the experience of the war will be kept secret as long as practicable. Nor is there any ground for dissent from this principle. For whilst it is true that at the present time there is no rivalry of naval armaments in the sense that existed between this country and Germany before the war, yet so long as the nations continue to build fighting ships they are really in competition.

From the length of time it would take, and the cost it would involve, according to Admiralty computation, to extend existing dockyard slips sufficiently to receive the new keels, we may infer that, so far from any reduction of displacement, as had been suggested, the vessels are likely to prove bigger than anything yet built. It is also regarded as certain that they will possess a very high speed, and an unprecedentedly wide radius of action.

As to whether the new vessels will be battleships or battle-cruisers, in their official definition, this seems to have become a really immaterial point. For the fact is the two types have nowadays become so merged that it is not easy to differentiate between them. Thus the *Hood* is easily the most powerful ship in the British Navy alike in her aggressive and defensive qualities. Whilst she is in reality a super-battleship, she is classed as a battle-cruiser merely by virtue of her speed.

The original idea of the battle-cruiser was a vessel of a lower fighting value than a battleship, in consequence of the sacrifice in armament and armor necessitated by the demands of a much higher speed. The *Inflexible* group, which were the first of the new type, although only 700 tons less in displacement than the *Dreadnought*, carried eight 12-inch guns as against ten, and were only armored with a belt of 6-inch Krupp steel, tapering to 4-inch, as compared with the 11-inch and 6-inch broadside of the *Dreadnought*. But then they had turbines developing 41,000 shaft horsepower, as compared with the 27,500 shaft horsepower of the *Dreadnought*. Their extra speed of five knots was regarded as well worth the price of reduced fighting power and we find this same principle relatively maintained in successive types down to the *Lion* class.

With the advent of the *Queen Elizabeth* class it was believed that the two types had become merged, and that no more battle-cruisers, as such would be built. The vessels of this group added to the most formidable aggressive powers which had ever yet materialized the same rate of speed as the *Inflexible* class. The war, however, brought new ideas—

or more strictly speaking, a reversion to the earlier idea—on this subject, and the *Repulse* and *Renown* were built. These vessels, of 26,500 tons, are the fastest capital ships ever constructed, not excluding the *Hood*.

But their protective qualities were hopelessly out of proportion to their 15-inch armament. Their broadside belting only consisted of 6-inch-3-inch armor. The *Repulse* has been reconstructed at an expenditure of more than half her original cost. It was only a logical sequence to the reasoning which produced these vessels to turn out the *Courageous* type with no broadside belting at all. Jutland emphasized the immeasurable tactical value of very high speed, and the *Hood* was the result. We shall probably henceforward see only one type of capital ship constructed, embodying in the highest degree all the qualities of the battleship, coupled with the great mobility of the battle-cruiser.—*The Naval and Military Record*, 27 July, 1921.

THE NAVY'S "BIG FOUR."—According to present arrangements the specifications for the new battleships will be ready in about a month from now, and tenders will then be invited from the several firms which are in a position to undertake such work. After the contracts have been awarded some months must elapse before building operations can begin, and it is therefore doubtful whether the keels of any of the vessels will be laid much before the end of the year. As their construction is to occupy three years they will presumably be passing into service about the beginning of 1925. Replying to questions in the House of Commons last Thursday, the Prime Minister made it plain that the execution of the battleship program will not be affected by the forthcoming Washington Conference. This disposes of rumors to the contrary which had been circulating in London. Mr. Lloyd George availed himself of the opportunity to repeat the disclaimer contained in the First Lord's memorandum on the Navy Estimates, that "in making this long-delayed beginning with the replacement of obsolete ships the government neither commits itself to nor contemplates any building 'programs' in answer to those of any other Power." Used in this connection the term "program" is given a somewhat sinister import, though it is quite certain that there is nothing sinister about our building project for the current year. If the capital ship is to remain the principal unit of naval power, four new vessels of this type represent the irreducible minimum needed to maintain the British Navy in its relative position of strength. They will be our only genuine post-Jutland ships, whereas America will have 16 and Japan at least 12 capital ships designed and laid down subsequent to the Battle of Jutland.—*The Naval and Military Record*, 27 July, 1921.

U-BOATS SUNK.—Ex-German submarines *U-135* and *161*, which under the terms of the Peace Treaty had to be destroyed or rendered unfit for further service, were at 5 a. m. on Thursday towed from Devonport by the tugs *Retort* and *Rover*, accompanied by the *Adamant*, depot ship of the Second Submarine Flotilla, and submarines *L-21* and *52*.

Fine weather prevailed, and the craft proceeded to a point about 60 miles south of the Eddystone Lighthouse, where the sinking of the U-boats by gunfire from the 4-inch guns of the submarines was ordered to take place.

Shortly before dusk that night it was reported that the operations had been completed and the vessels were returning to port.—*The Naval and Military Record*, 20 July, 1921.

BIG-GUN SUBMARINES.—Submarine *M-3* has been completed to full crew at Portsmouth, and is to join the First Submarine Flotilla of the Atlantic fleet. She is the first craft of her class to be attached to a seagoing fleet for regular service. Other boats of the same type are to replace the *K* submarines in the flotilla, which are all to be withdrawn from regular

commission. When the reorganization of these forces is complete, the Atlantic fleet will have only *L* and *M* submarines affiliated to it.

The *M* boats have been described, more picturesquely than accurately, as submarine-battleships, owing to the fact that they are armed with a 12-inch gun. In addition, they carry the usual torpedo armament. Designed late in the war, they were intended to act as independent units rather than in flotilla formations. In a fleet action their heavy weapon would be of comparatively small value, since they would have to expose themselves on the surface for an appreciable spell to fire, thereby presenting a big target to enemy fire. Indeed, the rôle of the submarine acting with a battle fleet is likely to remain restricted to underwater attack. But many situations may arise during the course of a sea war in which the sudden appearance of a vessel armed with a 12-inch gun, and of a tolerably high rate of surface speed, might effect a decisive result.—*The Naval and Military Record*, 20 July, 1921.

PAUSE IN DEVELOPMENT.—We appear to have come to a pause in the development of the submarine, alike in size and armament. The disaster to *K-5* was attributed to the fact that she dived too deep, owing to her great length and displacement, and doubtless this loss has exercised a very definite influence upon the whole question of submarine design. But probably a still stronger reason for the lull in progress, not only in this country, but in the United States and Japan, is uncertainty as to the tactical value of the giant submarine.

More than two years ago Sir Eustace d'Eyncourt pointed out that there were no mechanical difficulties in the way of building submersible battleships, but that it was not worth while. Sir Percy Scott succeeded in stirring up and maintaining a "stunt" upon the subject, but when it came to be submitted to an expert tribunal they upheld the views of the Director of Construction. The general conclusion in naval circles is that the submarine has passed the zenith of her possibilities against surface craft: that she can never be as formidable in the future as she has been in the past.—*The Naval and Military Record*, 20 July, 1921.

NAVY'S OIL FUEL.—In an order issued last week, the Admiralty notify that Mexican oil fuel may be used in all battleships and battle-cruisers fitted with heating coils, and should be supplied to these vessels on every possible occasion (except for use in Diesel engines) in preference to any other description. Arrangements are being made to carry out trials with Mexican oil in light cruisers and destroyers, with a view to extending further use of this oil.

In another order the Admiralty direct that in order to conserve the more fluid descriptions of oil fuel and those which do not increase greatly in viscosity under conditions of prolonged storage, a mixture of 50 per cent Persian and 50 per cent Mexican oil fuel should be issued to the fleet during the warmer months whenever such descriptions of fuel are available.

This mixture is to have priority in supply over all other mixtures during the period April 1 to September 30, except in the case of supplies: (a) For use in Diesel or semi-Diesel engines. (b) To vessels proceeding to any area where sea temperatures of 50° F. or below are likely to be encountered. (c) To battleships and battle-cruisers which burn Mexican fuel unmixed so far as heating coils admit.

This Persian-Mexican mixture should be utilized before any other stocks on board H. M. ships and any quantity remaining on board H. M. ships due to pass into the reserve fleet should be returned to store before vessel passes into reserve.—*The Naval and Military Record*, 20 July, 1921.

RECONSTRUCTING THE JUTLAND BATTLE FOR THE "MOVIES."—The recent war has been thoroughly recorded for posterity. There is no doubt about

it; for books, documents, photographs and motion pictures are available on practically every detail of the great conflict.

The latest contribution to the rather voluminous motion picture records of the war is an ingenious film depicting the naval Battle of Jutland, and recently produced in England. The stirring battle was reconstructed with infinite care and accuracy by means of miniature battleships, and animated for the motion picture film in the manner generally followed in producing trick pictures. The reproduction of a moving bird's-eye view of the Battle of Jutland for the films proved to be an immense task, we learn from *The Illustrated London News*. The work was carried out according to track charts prepared by Sir George Ashton, by a British film company, on a board measuring 8 feet square. The model ships were made in three sizes—4-inch for close-ups, 2-inch for medium shots, and 1-inch long for long shots. Ships, "sea" and "sky," were painted in shades of gray. Gunfire and explosions were produced by blowing smoke through pipes. For each picture each model had to be moved only 1/16 of an inch. There are sixteen pictures to every foot of motion picture film, hence the passage of the Grand Fleet across the North Sea required 90 feet of film, and 80,000 separate movements by hand of the models. That of the German fleet required 60,000 movements.—*Scientific American*, 16 July, 1921.

JAPAN

JAPAN AND THE ALLIANCE.—Japanese papers do not appear to have been greatly impressed by the eloquent plea of Mr. Hughes, the Premier of Australia, in favor of renewing the alliance. Until lately, they declare, he was just as eloquent in opposing it, and they ascribe his change of heart to the discovery that a navy strong enough to protect Australia if the alliance lapsed would cost too much money to build. But when it comes to denouncing inconsistency, our Japanese friends should remember that they lay themselves open to the same charge. A correspondent reminds us that the present enthusiasm in Japan for the alliance is strangely at variance with that country's attitude during the war. In 1915 the journal *Yamato*, after deriding Britain's military powers, wrote of the Germans as being inspired with "sound, excellent, and noble ideals, closely approaching the Japanese people and their bushido spirit. Seeing," it added, "that Japanese civilization is fashioned after the German rather than the English model, why should the Japanese hesitate to admire and emulate Germany's strong points?"

At the same period, Major Miwa, a Japanese military correspondent, wrote slightingly of the British troops, and declared that they had to be bribed with luxuries to join the colors. This was at a time when we had recruited far more than a million volunteers! In December, 1915, when Germany was apparently having things all her own way, Prof. Tatebe Tongo, of the Tokyo Imperial University, was writing in this strain: "As the national ideal of England is individualism and selfishness, so the guiding principle of England in international affairs is also individualism and selfishness. Such nations as Japan and England can never continue long in alliance." The British, he added, were a race of effeminates, with whom Japan could not afford to keep company. "Is it not time," he demanded, "to talk about separation?" Other writers joined in condemning the alliance as obsolete and worthless, and the government, which maintains a strict hold over the press, did not see fit to intervene. We recall these facts, not to cast doubt on the sincerity of Japan's friendship for us, but merely to show that in her case, as perhaps in our own, altruism is not the only factor which dictates foreign policy.—*The Naval and Military Record*, 20 July, 1921.

AN ANGLO-YANKO-JAPANESE TRIANGLE.—Within the triangle formed by a naval agreement between Britain, Japan, and America "there would be nothing in the world which could not be done," according to the London *Times*, and its remark is warmly indorsed by various Japanese newspapers. Among these is the Tokyo *Jiji*, which interprets it as meaning that the co-operation of Japan, Great Britain, and America is the first requisite of world peace, and it maintains that such co-operation premises a naval disarmament agreement between the three countries. Then it will be possible to arrive at an understanding with America regarding the object of the Anglo-Japanese alliance, which is to insure the peace of the Far East, and this important Tokyo daily says that "at the same time the hypothetical enmity between the three countries can be rectified, with the result that their peoples will enjoy greater happiness and all mankind will be freed from the excessive burdens of armaments." The *Jiji* proceeds:

"Let us then turn attention to the New York *World* which says that unless America abandons the ambition of establishing the world's first navy, there can be no hope for a naval agreement and consequently no permanent peace will come to the world. This shows that the idea of promoting the world's peace on the basis of a naval agreement between Japan, Great Britain, and America is supported by an influential body of opinion in America also. Even when the situation is considered theoretically, a disarmament agreement and co-operation for peace are only two sides of one policy, and it is natural that an agreement between the three countries for the restriction or reduction of naval armaments should have a close bearing on their co-operation in the cause of peace. There is no doubt that the agreement should be based on that co-operation."

Some say it is useless to talk of an armament agreement among the three countries unless a triple *entente cordiale* is first established. In fact, a naval agreement under the present international relations, they say, is "putting the cart before the horse." This plea is admitted by the *Jiji* to be reasonable, though it believes it is overstepping the mark to hold that the proposal for a naval agreement without the *entente cordiale* is an empty dream, and it adds:

"In our opinion the highest object to be kept in view by the three countries in co-operating for their own peace and for the peace of the world is the very agreement for the prevention of armaments competition between themselves. There can be no other matter which requires more urgently to be made the basis of the tripartite co-operation. Even granting that there is a more urgent objective than a naval agreement, the latter will continue to demand the earnest and sincere efforts of the governments and peoples of the three countries. Nay, since an armament agreement signifies the restriction or reduction of armaments on the basis of mutual trust, it itself is an important instance of co-operation, and therefore such an agreement will automatically have the effect of bringing about broader co-operation between the three countries. In view of the fact that the wishes of the governments of Great Britain and America and the desires of their governments regarding an armament agreement have already been demonstrated and the matter is now entering upon the stage of action, it is wide of the mark to say that the co-operation of the three countries and an armament agreement are in the relation of the principal and the auxiliary or to point out the questions pending regarding Yap and Mesopotamia and say that it is of no use to talk of an armament agreement under the existing circumstances. While urging people holding such opinions to reconsider their points of view, we would advise the government and people to make greater efforts for the realization of a naval agreement between the three countries.—*The Literary Digest*, 6 August, 1921.

UNITED STATES

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION, AS REPORTED JULY 31, 1921

Type, number and name	Contractor	Per cent of completion			
		Aug. 1, 1921		July 1, 1921	
		Total	On ship	Total	On ship
Battleships (BB)					
44 California	Mare Island Navy Yard	99.	99.	98.	98.
45 Colorado	New York S. B. Cpn.	77.1	75.2	75.4	73.5
46 Maryland	Newport News S. B. & D. D. Co.	Del. 7-20-21		99.5	99.3
47 Washington	New York S. B. Cpn.	68.8	62.4	67.3	60.8
48 West Virginia	Newport News S. B. & D. D. Co.	59.3	51.3	57.	48.2
49 South Dakota	New York Navy Yard	32.8	26.5	32.2	25.7
50 Indiana	New York Navy Yard	31.2	24.	29.8	22.7
51 Montana	Mare Island Navy Yard	26.6	18.8	26.1	17.3
52 North Carolina	Norfolk Navy Yard	36.1	27.1	35.8	26.6
53 Iowa	Newport News S. B. & D. D. Co.	28.3	24.7	26.3	22.6
54 Massachusetts	Beth. S. B. Cpn. (Fore River)	10.4	3.9	8.6	3.0
Battle Cruisers (CC)					
1 Lexington	Beth. S. B. Cpn. (Fore River)	23.1	13.8	21.1	12.3
2 Constellation	Newport News S. B. & D. D. Co.	12.5	10.3	11.5	9.
3 Saratoga	New York S. B. Cpn.	25.6	16.9	24.2	15.4
4 Ranger	Newport News S. B. & D. D. Co.	2.2	.9	2.	.8
5 Constitution	Philadelphia Navy Yard	10.4	5.9	9.2	5.2
6 United States	Philadelphia Navy Yard	10.2	5.7	9.2	5.2
Scout Cruisers (Light Cruisers CL)					
4 Omaha	Todd D. D. & Const. Cpn.	93.9	85.7	93.	84.7
5 Milwaukee	Todd D. D. & Const. Cpn.	91.3	83.	90.5	82.1
6 Cincinnati	Todd D. D. & Const. Cpn.	86.2	78.8	84.4	77.9
7 Raleigh	Beth. S. B. Cpn. (Fore River)	63.2	45.6	59.7	41.5
8 Detroit	Beth. S. B. Cpn. (Fore River)	63.7	46.1	59.8	41.6
9 Richmond	Wm. Cramp & Sons Co.	69.	51	67.	45.
10 Concord	Wm. Cramp & Sons Co.	65.	45	64.	42.
11 Trenton	Wm. Cramp & Sons Co.	50.	32.	47.	30.
12 Marblehead	Wm. Cramp & Sons Co.	46.	28.	45.	27.
13 Memphis	Wm. Cramp & Sons Co.	40.	25.	39.	24.
Auxiliaries					
Fuel Ship No. 18, Pecos	Boston Navy Yard (Oiler AO 6)	99.	99.	97.2	97.
Repair Ship No. 1, Medusa (AR 1)	Puget Sound Navy Yard	66.	50.3	63.6	48.1
Dest. Tender No. 3, Dobbin (AD 3)	Philadelphia Navy Yard	66.3	66.	64.8	64.5
Dest. Tender No. 4, Whitney (AD 4)	Boston Navy Yard	30.6	24.5	28.9	21.9
Sub. Tender No. 3, Holland (AS 3)	Puget Sound Navy Yard	21.5	5.5	20.2	4.2
Aircraft Tender, Wright (AZ 1)	Tietjen & Lang	87.	....	80.	....
Patrol Vessels					
Gunboat No. 22, Tulsa (PG 22)	Charleston Navy Yard	70.3	52.1	69.2	50.5

In addition to the above there are under construction 4 destroyers, 4 fleet submarines, and 37 submarines.

Authorized but not under construction or contract 12 destroyers, 7 submarines and one transport.

OUR LATEST BATTLESHIP, THE "MARYLAND."—When the super-dreadnought, the U. S. S. *Maryland*, steams out of Hampton Roads early in November and points her clipper bow toward the sea for her official government trials, the nation will hail a new pride of the navy and the navy itself will acknowledge a new Queen of the Seas.

The *Maryland* is in every respect the latest completed achievement of American naval architects. Carrying eight 16-inch guns, the largest ever mounted in a battleship, she will be the most powerful fighting vessel in the world. These mammoth guns, located in four turrets of two guns each, fire a shell weighing 2100 pounds for an extreme distance of more than 20 miles. The guns are over 60 feet in length and for each full charge approximately 480 pounds of powder are required.

The secondary battery, consisting of fourteen 5-inch guns, is carried for use against torpedo-boats, submarines and other smaller craft. The ship has also four 3-inch anti-aircraft guns, a 3-inch landing gun, six .30 caliber machine guns and two under-water 21-inch torpedo-tubes for firing the largest and longest range torpedoes.

The *Maryland* possesses all the latest provisions for protection against torpedo attacks. It is claimed by naval architects that it would require several hits by torpedoes to sink the ship by an under-water attack. The crew and vital parts will be protected by armor plate so thick that only the largest caliber shells, fired at moderate range could get through.

Displacing 32,600 tons, this fine warship, electrically driven, will have a speed of 21 knots and a cruising radius of 10,000 miles. She will burn oil, her fuel capacity being approximately 1,400,000 gallons.

The *Maryland* is 624 feet long and has a beam of 97½ feet. There will be 67 officers in the ship's complement and more than 1400 men in her regular crew.

This most modern of warcraft recently completed her builders' trials with a perfect record. For 33 continuous hours at sea off the Virginia Capes, she was put through all sorts of tests, bringing into play the greatest possible stress on all parts of her machinery and equipment; but not the slightest trouble was experienced. In fact, naval officials declared she operated more like a boat that had been in service four or five years, so readily and easily did she respond in the tests.

Captain Charles F. Preston, who has been assigned to the command of the *Maryland*, and was aboard during the preliminary trials, is most enthusiastic over the perfect performance of the new electrically-driven ship. "Never on a warship that pleased me more in my 36 years with the navy. She's a wonder in every respect, the best warship in our navy and the most powerful in the world," he declared; "I am highly pleased and satisfied with her electric equipment. There is practically no vibration and sometimes I actually looked out to sea to learn if we were under power, so quietly and smoothly did her machinery operate."

Like her prototype, the *New Mexico*, pioneer electric warship of the world, the *Maryland* is electrical throughout. Her main propulsion machinery consists of two Curtis steam turbine generators, each designed to develop 11,000 kilowatts at a speed of 2030 revolutions per minute to drive the ship 21 knots. These supply power to four 7000-horsepower General Electric induction motors, directly connected with the four propellers and turning at 170 revolutions per minute. The motors, among the largest ever built, are 12 feet in diameter, weigh 62 tons, and the 28,000 horsepower thus available for propulsion purposes is enough to supply power to a city of 100,000 population.

The two turbine generators, supplied with steam generated by oil-burning boilers, can be run independently. Either is capable of driving the ship up to a speed of about 17 knots. The power generated by them is used for no other purpose than propelling, electrical current for other needs being generated by six 300-kilowatt turbine generators.

Virtually every electrical appliance used afloat and ashore has been installed in this new battleship. The electrical equipment includes radio telegraph, loud speaking telephones, ordinary telephones, gyroscope compass, steering gear, anchor windlass, capstan, boat cranes, winches, air compressors, air heaters, turret training, turret gun elevating, ammunition hoists, gun firing, range signaling, powder testing oven, common deck fans, ice machines, laundry equipment, carpenter shop, lighting, visual signals, motion pictures, sterilizer in operating room, potato peeler, ice cream freezer and other kitchen utensils, bake ovens, irons for laundry and tailor, storage batteries, motor boat ignition, etc.

It is probable that no ship built by any nation in the past has been so thoroughly equipped for the comfort and convenience of the crew.

A completely equipped hospital will be maintained on board with navy surgeons to look after the health of the crew and a dentist to look after the men's teeth. A chaplain will be assigned to the ship to hold regular church services and to devote his time to spiritual welfare of the officers and men.

The *Maryland* is third in order of completion of the electrically-propelled battleships for the navy. She was built by the Newport News Shipbuilding and Dry Dock Company and the electrical equipment was designed and manufactured by the General Electric Company.

The ship was launched on March 20, 1920. Her chief characteristics are:

Length	624 feet
Beam	97½ feet
Draft	30½ feet
Weight	32,000 tons
Speed	21 knots
Number of propellers	4
Shaft horsepower	30,000
Oil capacity	1,400,000 gallons
Oil-burning boilers	8

Three more battleships of this type are being built: the *West Virginia* to be ready for her trial trips in 1922, the *Colorado* and the *Washington*. In addition the navy is building six 43,000-ton, 60,000-horsepower battleships and six battle-cruisers, the latter rated at 180,000 horsepower each, which makes the propelling machinery six times as powerful as that of the *Maryland*. Both of these types of warships will carry 16-inch guns and will be electrically driven.

Production of the electrical machinery for several of these vessels is now progressing under the direction of W. L. R. Emmet, who advocated the principles of the electric drive as long ago as 1909, was instrumental in its adoption by the government and designed the first electric drive installed by the navy on a battleship, now working so successfully on the U. S. S. *New Mexico*.—*The Scientific American*, 16 July, 1921.

THE SEAPLANE TENDER U. S. S. "WRIGHT."—It is now expected that the U. S. S. *Wright*, the new seaplane tender for the navy will be placed in commission about August 15, 1921. She will take the place of either the *Aroostook* or the *Shawmut*, now being used for that purpose in the Pacific and Atlantic Fleets. The vessel is named in memory of Wilbur Wright.

Arrangements were made with the U. S. Shipping Board late in 1919 for the Navy Department to take over one of the Emergency Fleet Corporation's type B ships, Hull No. 680, then building at Hog Island for the Shipping Board, and to convert the vessel into an aircraft tender for kite balloons and seaplanes for the U. S. Navy. The hull was launched at Hog Island on April 28, 1920, and contract for the conversion work was let to Tietjen and Lang Dry Dock Company, of Hoboken, N. J., on June 30, 1920.

The conversion work now being executed by Tietjen and Lang Dry Dock Company includes additions, changes and alterations necessary to fit and complete the vessel in every respect for sea service, including provisions for the stowage of six kite balloons, for the inflation and housing of kite balloons aft in a balloon well, for the necessary hydrogen generating plant for balloon inflation, for hydrogen stowage and for efficient repair plants for the balloons and seaplanes.

The vessel is being arranged for flying operations of kite balloons and as a tender for seaplanes, carrying spare wings and other spare parts.

The quarters are being arranged to accommodate the ship's own complement and officers, and officers and personnel assigned to the care and operation of the kite balloons and seaplanes. Berthing and messing accommodations are being provided for the captain, one detachment commander, 28 wardroom officers, 20 junior officers, 12 warrant officers, 60 chief petty officers and 450 men. The chief petty officers will be berthed in pipe berths and the crew in hammocks. The hospital space will include: Operating room, treatment room, sick bay bath, isolation ward, surgeon's room, dispensary, isolation bath, sick bay, and dental office. The commissary space will consist of: Officers' and crews' galley, potato peeler room, bakery and bread room, cold storage, general mess issuing room and butcher shop.

There will be a barber shop and a fully equipped laundry. An aerological laboratory and pigeon coop are being provided; also a photographic laboratory, together with dark room, developing room, and printing apparatus. A hydrogen generator of large capacity, constructed to use salt water for cooling, a number of hydrogen compressors, a large number of hydrogen flasks and an air blower for the kite balloons and two balloon winches will be installed for use in the flying operations and inflation of balloons.

The repair facilities will consist of the following: Wire assembly shop, tool issuing room, blacksmith, foundry, sheet metal and coppersmith shop, carpenter and pattern shop, machine shop and motor erecting shop, electrical work shop, fabric and dope shop. Two balloon winches are being fitted for use in flying operations of balloons.

A large space forward is provided for wing section stowage, and a large hatch in the weather deck for the purpose of getting the wing sections below. Space will also be available for the stowage of spare parts for kite balloons and seaplanes, for boatswain stores, supply department stores, canvas and awnings, lumber, pipe, bar, plate, and metal racks, engineer's stores, electrical stores, chemical stores, officers' stores, etc.

The battery will consist of four 5-inch 51 caliber guns, two forward and two aft, also two machine guns. Ammunition stowage is provided for the regular allowance of ammunition for these guns. The principal dimensions, etc., of the U. S. S. *Wright* are as follows:

Length over all	448 ft.
Length between perpendiculars	448 ft.
Breadth molded	58 ft.
Draft	31 ft.
Displacement (normal)	14,240 tons
Speed (about)	15 knots

—*Aerial Age*, 20 June, 1921.

FORD MAY ACQUIRE BIG NITRATE PLANT.—Secretary Weeks announced last night that he would ask Congress for authority to accept a proposal by Henry Ford for acquiring the government nitrate plant at Muscle Shoals, Ala., if the offer was found to be "substantial." The proposal, which was transmitted by Secretary Hoover yesterday, was on his desk, Mr. Weeks said, adding that he would begin the study of its terms at once.

Mr. Ford offers to buy the nitrate plant, equipment and lands for $5,000,000 and lease for 100 years the Wilson and No. 3 dam, when com-

pleted, at an annual obligation of $1,500,000. He proposes to convert the works into a fertilizer plant, the profits of which would be limited to 8 per cent and to keep it in readiness for the manufacture of explosives by the government in time of war. If acceptance of the offer is found advisable, Mr. Weeks said, he would ask Congress for authority to sell the plant and lease the dams and for an appropriation to complete the electric installation on them. This work is estimated to cost $28,000,000 and on this sum Mr. Ford proposes to pay interest at the rate of 6 per cent and to amortize the entire cost of both over a period of 100 years.—*The Washington Post*, 15 July, 1921.

LAUNCHING OF DREADNOUGHT.—The Navy Department has designated Thursday, September 1, as the date of the launching of the superdreadnought *Washington* at Camden, N. J. The giant vessel will dip the water at 2.15 o'clock in the afternoon.

Miss Jean Summers, 10-year-old daughter of Representative John W. Summers, of Washington, who will christen the battleship with a bottle of water taken from the rivers and lakes of her native state, has been notified of the launching date and she now is arranging her party.—*The Washington Post*, 8 August, 1921.

A NEW NAVAL PROGRAM.—Naval conservatism gasped when the *Ostfriesland* went down. And well it might! Minds that had controlled our naval policy and building program, resisting every modern conception, obstinately clinging to five-year-old ideals, were suddenly jarred into a partial realization of their folly. But extreme conservatism always dies hard. Like the doomed paralytic, it may survive several strokes. Obstinacy often grows with inevitable defeat staring it in the face. The bomb of progress and common sense must blow it to smithereens before it will cease to harp upon its one lone ancient chord!

The advent of the *Monitor* in the Civil War wrought a change in naval architecture, nothing more. It simply introduced the turret into the battleship, where it still remains as the one salient element of power in the dreadnought of to-day. But the sinking of a destroyer, a cruiser and a battleship by bombs alone will exert an influence upon warfare afloat and ashore vastly more far reaching in its consequences than the invention of the *Monitor*. It will not only force a change in battleship design, but it introduces a new and dominating force—a veritable navy of the air.

The airplane carrier has suddenly forced itself upon the navy as a capital ship. Its three principal weapons—the bombing plane, the mine-laying plane and the torpedo plane—which are interchangeable, have a range of 100 miles or more, while the guns of a dreadnought or battle-cruiser have a maximum effective range of only 15 miles, and even this cannot be attained without the aid of airplanes to note and report the fall of their shell!

Will conservatives now contend that a 2000-pound bomb or a 21-inch torpedo or a heavy mine will not sink, or at least disable, a dreadnought or battle-cruiser? They must not forget that the British dreadnought *Audacious* was sunk by a mine or a torpedo; that the *Hampshire*, with Kitchener on board, was sunk by a mine; that 62 of the 142 British men-of-war lost in the World War were victims of the submarine; that our cruiser *San Diego* was sunk and our battleship *Minnesota* was disabled by a mine.

Moreover, we must realize that the airplane will soon carry a 4000-pound bomb, and the plane as well as the submarine may easily carry a 30-inch torpedo with a charge of 1500 pounds of T. N. T. Will the battleships and battle-cruisers of the 1916 program survive these charges of high explosives? Remember the *Ostfriesland!*

It is folly to claim that the aviator cannot hit a battleship under way. The airmen declare that it is easier to hit a moving ship than one that

is anchored. They know what they are talking about and they assert that anti-aircraft guns will not deter them. They will use poison gas and smoke screens against the ship's gunners and will choose their own time to attack.

It must be remembered that a ship in battle, with her magazines filled, her boilers and engines, steering gear and fire control in operation, is far more vulnerable and may be more easily sunk or disabled than an armored hulk at anchor. One bomb may wreck her steering gear or fire control and make her useless.

Furthermore, the mine may be laid as a barrage ahead of a fleet. The fleet may be fenced in with mines, and torpedo planes may attack from a safe distance ahead.

The writer has spent his life in contact with and in training young officers and men of the navy. Knowing the mettle and absolute fearlessness of these young men, he believes that if they are told to go and put a 2000- or 4000-pound bomb, mine or torpedo on board or under an enemy ship, they will do it. And it is reasonable to suppose that there are young men in foreign navies who will do the same thing. They will choose their time and they will do it. The fact is that sinking or disabling men-of-war with bombs, mines or torpedoes is easier than to put them out of action with guns. The $45,000,000 big-gun ship is too expensive and too vulnerable. It can be sunk by an airplane carrier 100 miles away—80 miles beyond the reach of its guns.

A new naval program may be briefly outlined to meet modern conditions and to prevent waste of hundreds of millions of dollars.

We now have 18 dreadnoughts, counting the *California* and *Maryland* just completed. The *Colorado, Washington, West Virginia* and *South Dakota* are well advanced and should be completed. This will provide a battleship force of 22 powerful dreadnoughts. This is enough.

The *Indiana, Montana, North Carolina, Iowa* and *Massachusetts* are from 8 per cent to 29 per cent completed. Construction of these ships as battleships should cease and plans should be made to transform them into airplane carriers, armored or otherwise, as may be deemed best. These carriers could remain with the battle fleet to supply its protective and spotting planes while the faster carriers are sent ahead to attack the enemy.

There are six battle-cruisers from 5 per cent to 15 per cent completed. Construction upon these ships as cruisers should cease and they should be transformed into carriers. To be sure, there are many who emphasize the need of battle-cruisers. If these ships were well advanced it might be well to complete them. But they are not. It is submitted that the carrier can perform all the functions of a battle-cruiser.

In this connection it must be borne in mind that the people and Congress simply will not give us the money to complete all the ships of the 1916 program and in addition several hundred millions for carriers. We must make a choice. If we want carriers we must surrender something that we do not need.

It has been proposed to build one or two carriers. This is not enough. It will not secure command of the air. It will leave our fleet helpless—powerless. We need eight carriers. It is only by transforming capital ships that we can get them. It is the only alternative.—*New York Tribune*, 31 July, 1921.

THE U. S. PACIFIC CONCENTRATION.—There is now but little doubt that the policy of the new American Administration is to concentrate the bulk of its naval forces in the Pacific. This, however, may be done gradually and without either a formal announcement or a sudden transfer of whole formations from one coast to another, since either step would undoubtedly lead to much comment, irresponsible and otherwise, and create in Japan an impression which American statesmen are sincerely anxious to avoid.

Nor, irrespective of political consequences, may it be deemed expedient to mass in the Pacific a fleet comprising nearly all the effective units of the U. S. Navy. Most of the dockyard and base facilities necessary to keep a very large fleet in a state of high efficiency and readiness for immediate action have yet to be built. Various projects, conceived on a grand scale, have been mooted for the enlargement of existing bases on the western coast and the creation of additional yards at strategic points, but very little has been done up to now to give effect to these plans. Consequently, if the Atlantic and Pacific Fleets were suddenly merged into one and based at San Francisco, Bremerton, or Hawaii, the dockyard resources of the Pacific Coast would be wholly inadequate to maintain such an armada. Including the private dock (Bethlehem Union) at San Francisco, and the new one at Hawaii, there are only five dreadnought docks available for American ships in the Pacific, and it is doubtful whether more than three of these could take the battle cruisers now under construction.

It is probable, therefore, that the process of concentration will be limited for the time being to the replacement of older vessels by those of the latest type. It will not have escaped attention that the Navy Department is sending every new capital ship to the Pacific as soon as its trials are finished. The *New Mexico* was transferred to that ocean in 1919 as flagship; the *Tennessee* left for the same destination last May, and it is stated that the *California*, completing at Mare Island, will also join Admiral Rodman's flag before the end of the year. Finally, the American service papers say that all four ships of the *Maryland* (16-inch gun) class have been provisionally assigned to the Pacific, as also have four of the battle cruisers. By midsummer, 1924, it is hoped to have on the western coast a fleet of 12 battleships and four battle cruisers, none more than seven years old from the date of launch. But if this scheme is to be realized it will be absolutely essential to develop the Pacific base facilities without delay. American naval officers, who are under no illusions as to the war value of a fleet without proper bases in the approximate fighting zone, are hopeful that Mr. Denby will have more luck than his predecessor in inducing Congress to vote money for the docks, repair plant, and fuel depôts which are so urgently needed.—*The Naval and Military Record*, 6 July, 1921.

PREPAREDNESS FOR WAR.—In an effort to get some definite idea as to what the leading nations are doing regarding armaments of the future, the *New York Herald* instructed its correspondents at Washington, London, Paris and Berlin to make inquiries and report. Here are some of the facts they ascertained:

The United States is proceeding with unabated zeal to develop her equipment to the last word as a guarantee of her future security from agression or invasion. There has been no attempt on the part of the officials entrusted with this preparedness program to attempt concealment, so that the country knows just what is going on all the time. The greatest stress, however, is in the development of big guns, poison gas and tanks, with an idea of ultimate motorization of all transportation. Among the available accomplishments, the United States has:

1. Radio control of submarine torpedoes.
2. Aerial torpedo for use in naval warfare.
3. Superguns for land and naval warfare.
4. Diphenychlorasine, a sneezing gas. Also clothing protected against gas.
5. Airplane carriers to go with battle fleets.
6. Three-seater triplanes with eight machine guns and 37-mm. guns for ground attacks.
7. Tractors with automobile wheels for good roads and caterpillar treads for cross-country travel.
8. New tank (details not yet revealed).

In addition to the above, the United States has projected:

1. Railway guns and tracks to protect every mile of coast line.
2. Liquid poison, three drops of which will kill a person on contact.
3. 3000-pound air bombs.
4. Illuminating projectiles for lighting up water areas to disclose submarines.

To carry out this program the Aberdeen Proving Grounds are considered the best in the world. The Chemical Warfare Service is carrying on its developments at Edgewood, not far from Baltimore, Md. The report of the Secretary of the Navy shows that the United States will surpass all others as a sea power with the completion of the present naval program, many ships being almost ready for delivery.

Great Britain is more secretive about her armament programs for the future, but it is a known fact that England is better armed to-day than at the time of the Armistice. When the Armistice was signed the British had planes ready to bomb Berlin, gases that could be projected a half-mile, irrespective of the wind and 2000 absolutely new tanks waiting to be let loose on the enemy to make him cry for mercy.

Some of the new weapons which Great Britain has added to her armament are:

1. Superairplanes of the V-Handley-Page type with a 3000-mile cruising radius, and carrying 1800-pound bombs.
2. One-man tanks and supertanks superior to those actually used in the war.
3. More deadly gases.
4. Means of exploding ammunition dumps by electricity from protected points in rear.
5. Sunken concrete towers to support submarine nets.
6. Floating magnets to divert enemy submersibles from their course.

In addition to these, England has proposed:

1. A noiseless machine gun.
2. Electrocution of enemy troops.
3. Submarine torpedo to carry a ton of T. N. T.
4. "Flying man-o-war." A superseaplane of 30,000 horsepower.
5. Flying destroyer with steel wings.
6. Bomb-proof roofs for docks and piers.
7. Use of the deadly powers of the X-ray.

France, too, in spite of the great losses she suffered in the war, has not been slow in developing her equipment for the next war. The armistice found France in a better position to carry on the war than at any time in the previous five years. With this as a nucleus, she intends to keep the vigil so that she will never again be surprised by her secular enemy, Germany. France now has in the way of new equipment:

1. Turbo-cannon giving longer ranges than the Big Bertha.
2. Submarine tanks capable of traveling submerged, crossing rivers, etc.
3. All-metal airplanes surpassing any hitherto used in warfare.

France also proposes to develop:

1. Huge rockets filled with explosives and oil to set fire to airplanes.
2. Shells propelled by a series of explosions to keep them in flight and which will give them a range of over 100 miles.
3. Gigantic aerial bombs and planes for the purpose of destroying whole cities.

Even Germany which is supposed to be disarming in accordance with the terms of the treaty of Versailles, is awake to the issues of the day and proposes a huge armored submarine which will withstand depth charges and the fire of the smaller craft. Had this been perfected in time, it would no doubt have had considerable bearing on the trend of the war.

Another German idea was the crewless ship, steered by wireless and designed to attack the Grand Fleet. However, with the exception of the Big Bertha, the German war inventions were of a less startling nature than those suggested and perfected by her adversaries. Nevertheless,

credit should be given the German chemists for their ingenuity in supplying the elements necessary in carrying on the war. From the air they extracted nitrogen, from glycerine coal tar, while other substitutes too numerous to mention were derived from the various sources.—*National Service*, August-September.

GOVERNMENT FLEECED UNDER PRESENT CHARTERING SYSTEM.—In an address to representatives of the press on Monday last, Chairman Lasker of the Shipping Board scored the present method of allocating government ships as follows:

"The boats are being operated to-day in the following shocking manner: An operating company is allocated a number of boats. They are allowed a commission of five per cent flat on gross revenue. The boat can lose all kinds of money—the taxpayers pay the losses, but the operator makes money just the same, because he gets his five per cent commission.

"If the operator carried not a single ton of cargo he lost no money, for the government paid for the operation of the ship from one end of the world to the other. The result hardly needs telling, but here are typical instances given:

"A steamship which was half-way across the Pacific turned back to the west coast for a cargo which would net the operator $4500. The cost to the government for the detour was $8000. Another line which had its own vessels in addition to government ships carried cargo in the Shipping Board vessels eastbound across the Atlantic, but filled the holds of its own vessels westbound where the cargoes were hard to obtain. A single ship of that line made five round trips and in all that time brought only 40 tons of cargo to the United States.

"It is nobody's fault that the present system prevails. Those boats were built when American operators had no experience and a system had to be developed to get them moving, and as long as times were good the system did not work out so badly, but anybody can see that a system whereby the operator has nothing at stake and the government loses and he wins is a system that makes for inefficiency.

"We must grin and bear that system for some months to come, because to establish such a charter system as will be developed by our new Vice-Presidents of the present Board is a matter almost as difficult, in a minor way, as it would be to negotiate the Peace Treaty of Versailles. It is a highly technical matter and must be approached with the greatest care. Out of 9000 voyages made since the present system took effect, only 3000 have been accounted for."—*The Nautical Gazette*, 6 August, 1921.

JAPANESE SHIPPING PASSING THROUGH THE PANAMA CANAL.—During the fiscal year ending June 30, 1921, 136 Japanese vessels passed through the Panama Canal carrying 767,608 tons of cargo. Their aggregate net tonnage under the Panama Canal rules was 613,245. One Japanese vessel passed through the Canal four times during the year, 11 three times, 25 twice, and 49 once only.

The following table shows the number of vessels under the Japanese flag which have passed through the Canal in either direction during each of the last seven fiscal years, or since the Canal was first opened to traffic on August 15, 1914:

Year	Atlantic to Pacific	Pacific to Atlantic	Total
1915	4	2	6
1916	19	5	24
1917	54	18	72
1918	33	20	53
1919	47	40	87
1920	84	34	118
1921	86	50	136
Total	327	169	496

It is remarkable that in each of the years covered by the table more Japanese vessels passed through the Canal from Atlantic to Pacific than in the opposite direction. For the entire seven-year period the proportion is nearly 2 to 1. A similar preponderance of vessels in one direction has been noted in studying other features of Canal traffic. It is apparently due to the fact that cargo steamers in the trade with the Orient commonly find it more profitable to move from port to port around the world, going out via Suez and returning via Panama, or vice versa, than to turn back over the same route followed in the outward voyage.

The principal Japanese steamship companies that passed vessels through the Canal in 1921 were: Osaka Shosen Kabushiki Kaisha with 38 vessels; Nippon Yusen Kabushiki Kaisha with 26 vessels; Kokusai Kisen Kabushiki Kaisha with 25 vessels; Toyo Kisen Kabushiki Kaisha with 10 vessels; and Mitsui Bussan Kaisha with seven vessels. The remaining 30 vessels in the list of 136 were distributed among 13 other owners.—*The Nautical Gazette*, 6 August, 1921.

WORLD'S MERCHANT TONNAGE AT CLOSE OF FISCAL YEAR.—Lloyd's Register for 1920-21 has just made its appearance and contains as usual full particulars of all sea-going vessels of the world in 100 tons and upward. The following table shows the number and gross tonnage of the vessels belonging to each of the principal maritime nations in June last:

Flag	No. of ships	Tonnage
United Kingdom	9,034	19,571,554
Australia and New Zealand	615	693,937
Canada	961	1,134,111
India and Ceylon	190	197,369
Other Dominions	633	473,827
United States	5,551	17,026,002
Argentine	209	167,154
Belgian	256	551,031
Brazilian	402	499,325
Chilian	124	113,447
Chinese	122	163,037
Cuban	59	58,553
Danish	798	964,464
Dutch	1,069	2,225,787
Esthonian	90	41,183
Finnish	330	198,352
French	2,044	3,652,249
German	1,255	717,450
Greek	362	599,929
Italian	1,271	2,650,573
Japanese	2,033	3,354,806
Latvian	99	53,342
Norwegian	1,889	2,584,058
Peruvian	68	87,167
Portuguese	284	296,847
Rumanian	37	73,973
Russian	465	412,459
Spanish	828	1,165,541
Swedish	1,353	1,160,211
Uruguayan	54	85,886
Other Countries	304	218,765
Flag Not Recorded	417	782,264
Total	33,206	61,974,653

The sea-going steel and iron steam tonnage owned by the principal maritime countries is shown below (000 omitted):

Country	Tons gross		
	1914	1921	Difference
United Kingdom	18,877	19,288	+411
British Dominions	1,407	1,950	+543
United States	1,837	12,314	+10,477
Austria-Hungary	1,052	Nil.	—
Denmark	768	866	+98
France	1,918	3,046	+1,128
Germany	5,098	654	−4,444
Greece	820	576	−244
Holland	1,471	2,207	+736
Italy	1,428	2,378	+950
Japan	1,642	3,063	+1,421
Norway	1,923	2,285	+362
Spain	883	1,094	+211
Sweden	992	1,037	+45
Total abroad	23,637	34,929	+11,292
World total	42,514	54,217	+11,703

The following comparison between the two years as regards the division of motive power is of interest:

	1914 Percentage total gross tonnage	1921 Percentage total gross tonnage
Sail Power only	7.95	5.05
Oil, etc., in internal combustion engines.	0.47	2.0
Oil fuel for boilers	2.62	20.65
Coal	88.96	72.30
	100.00	100.00

In 1914 there were 3668 sea-going steamers of 4000 tons and above each; there are now 5209.—*The Nautical Gazette*, 6 August, 1921.

AERONAUTICS

THE NEW MENACE TO SEA POWER.—A few months ago, it is recalled, Josephus Daniels, then Secretary of the Navy, volunteered to permit General Mitchell, of the Air Service, to drop all the bombs he pleased on a vessel which the Secretary himself would steer. But since four types of German war-vessels—submarine, destroyer, cruiser, and dreadnought—were sunk by airplanes flying at an altitude of from 1200 to 4000 feet in the past few weeks, declares the Newark *News*, "we shall have to take off our hats to General Mitchell and his officers; the Air Service has made good." "The high priests of capital ships *über alles* have found that even a dreadnought can be sunk from the air," notes the Norfolk *Virginian-Pilot*, whose editor had the advantage of being at the scene of the tests. "No guns in existence could have sunk the *Ostfriesland* short of many hours' firing, and no guns could have scored the hits which the airmen scored with their bombs," asserts the New York *Evening Mail's* correspondent at "the front," Clinton W. Gilbert; "here was a ship which required years to build, and cost $40,000,000, yet it was sent to the bottom of the sea by six bombs carried by machines costing less than $25,000 apiece."

"But battleships are not made obsolete by the recent bombing tests off the Virginia Capes," contends the Washington *Post*. The battleship, however, is no longer the "backbone of the navy," or the nation's first line of defense, thinks Raymond G. Carroll, writing in the Philadelphia *Public Ledger*, and Arthur Brisbane unequivocally asserts, in the New York *American*, that "to build $40,000,000 battleships is a stupid waste of money, done only to please shipbuilders." "Officers of the navy hate to see the battleship go, and struggle to retain it," he goes on, "but you must also remember that drivers of hansom cabs disliked to climb down from their high perch when the taxicab came in."

Other editors take a middle ground in discussing the tests. "The only good navy is a three-plane navy, strong in airplanes, ships, and submarines," is the conclusion reached by the New York *Globe* and a dozen other papers, while still others urge Congress to add a couple of aircraft-carriers to the navy or convert some of our cruisers for that purpose. Japan and England, they point out, have not been backward about building such ships. But the chief value of the tests is the knowledge that airplanes can sink capital ships, and that the navy will not be safe until it possesses ample protection against such attack, believes the Philadelphia *Bulletin*.

"The question as to what was proved by the demonstration will be discussed by the military and naval experts of the world for some time to come," notes the Brooklyn *Eagle*, "but one theory—the theory that the battleship is impregnable—has been knocked sky-high, or, rather, sunk without trace."

The first victim of recent tests off the Virginia Capes was the *U-117*, a former German submarine. Twelve bombs weighing 163 pounds each were dropped by navy seaplanes, with the result that the vessel sank within 15 minutes. The next experiment was with the old *Iowa*, upon which 80 dummy bombs of cement were dropped. These were dropped by navy and marine-corps fliers, and as the former battleship was controlled by radio and sent on a zigzagging course, and as the dummy bombs were not equipped with wind-vanes and therefore turned over and over, few direct hits were made, although at least half of the bombs fell within the danger zone. The airmen proved, however, that they could locate an incoming "enemy" battleship. A former German destroyer, the *G-102*, was next attacked by army airmen, who first dropped fragmentation bombs upon her deck to "clear them and put the anti-aircraft guns out of commission"—50 per cent of which registered direct hits—then sank the destroyer within 20 minutes with bombs weighing 300 pounds each. The former German cruiser *Frankfurt*, however, was not so easily vanquished. Fifty-seven 250- and 300-pound bombs made little or no impression on this armored vessel, so a division of army Martin bombers, carrying twenty-one 520- and 600-pound bombs, were ordered to attack. They found it necessary to use only 11 of the bombs, however, and in ten minutes the *Frankfurt* was beneath the waves. Throughout the tests many bombs failed to explode; they were "duds."

It was the *Ostfriesland* type that "could not be sunk," said naval officers. And great was their jubilation, say the correspondents, when 52 bombs, weighing from 230 to 600 pounds, 13 of which made direct hits, were dropped on the vessel with a resulting damage only to her superstructure. The next day five Martin bombers dropped five 1000-pound bombs on the former German dreadnought, making three direct hits, but the "pride of the German Navy," as she was called after the battle of Jutland, refused to go down. Six more Martin bombers then dropped a 2000-pound bomb apiece upon the helpless *Ostfriesland*, or, rather, so near her that the concussion, in the opinion of General Mitchell, would open her armor-plates, which were ten inches thick at the water-line. Four of these bombs, in the opinion of one correspondent, "answered quickly and dramatically the question as to whether an airplane could sink a battleship; the dreadnought sank in 25 minutes."

"The question really at issue," declares the Omaha *Bee* after the evidence is all in, "is whether money is being wasted in building $40,000,000 battleships." The Washington *Herald*, the Philadelphia *Inquirer*, the New York *Globe*, the Norfolk *Virginian-Pilot*, the Philadelphia *Public Ledger*, the Indianapolis *News*, the New York *Tribune*, the Dallas *News*, the Kansas City *Star*, the New York *Herald*, the Richmond *News Leader*, and several others believe that the money of the people is being wasted. "It has already been proved that the bombing airplane has the eyes to spy out the enemy, the wings to overtake him, and the weapons with which to wipe him out," notes the New York *World*. We should, therefore, provide the navy with more airplanes and at least two airplane-carriers, maintain the Newark *Evening News* and the Washington *Post*. "These vessels will be costly, but they will carry in their holds and upon their landing-deck the fate of both the aerial and naval forces, and thus they are indispensable," maintains the latter paper. As for planes, "a thousand can be built for the cost of one dreadnought, and they are four times as speedy as a battle-ship," points out the Passaic (N. J.) *Herald*.

"But what then?" asks the Boston *Herald;* "we have not ascertained what would happen in a real battle." Furthermore, says this paper, "the vessels destroyed in the tests were at anchor and undefended." "There are also clouds and smoke-screens to interfere with bombing airplanes," notes the Pittsburg *Ledger-Dispatch*. Others class the airplane with the torpedo and the submarine, which were heralded as the destroyer of the battleship. But means were taken to offset their attacks, and the navy will invent a method of nullifying bombing attacks, other editors believe. "Whatever form of destructive engine is developed, some form of protection will be evolved against it," thinks the Chicago *Tribune*. "There is nothing magical or omnipotent about the airplane," argues the Adrian *Telegram;* "it is simply one more new weapon. If opposing nations did nothing new, any nation armed with a new weapon could conquer the world. If airplanes can destroy warships, it simply means that every warship will have to have a bodyguard of airplanes." "Only aviation enthusiasts," announce that the day of the capital ship is over, concludes the Baltimore *News.—The Literary Digest*, 6 August, 1921.

• DEPTH BOMBING FROM THE AIR.—The United States Navy is to be congratulated upon the success which attended the recent elaborate air-bombing tests, extending over a period of several weeks, in the course of which several submarines and destroyers, a modern scout cruiser, and a 22,000-ton dreadnought were sent to the bottom. These ships were allocated to the United States as our share of that portion of the surrendered German fleet which was not sunk at Scapa Flow or was salvaged subsequently to that sinking. These ships were allocated with the understanding that they were to be completely destroyed before the close of August, 1921. The navy decided that they would destroy them under conditions which would stimulate, to some extent, the conditions of actual warfare. The plan of operations contemplated first, an attempt to destroy the ships by bombing from the air, and secondly, should the bombing fail to put them down, an attack by gun-fire. Should both of these efforts fail in the case of any ship, a wrecking crew was to be sent aboard and the vessel was to be sunk by high explosives placed within her hull. Many months ago, when these plans were formulated and before the discussion as to the relative value of bombing planes and battleships had grown to its present dimensions, the Navy Department, in a fine spirit of co-operation with the army, requested the Army Air Forces to join them in these bombing attacks. We wish to take this opportunity to contradict the popular impression, which unfortunately the daily press has done so much to develop, that there was any spirit or rivalry or fierce competition between the two

forces. As a matter of fact, the army greatly appreciated the opportunity thus presented, and the co-operation between the two was marked by good sportsmanship and perfect military co-ordination.

If we wish to get a true perspective of these experiments, we must bear in mind and it should be emphasized at the very outset, that the conditions under which the bombing was carried out were purposely made as favorable as possible for the attack. It should be understood that never again, except in the event of extreme carelessness and neglect, will any airplane force be able to fly, at its own chosen height and in its own chosen weather, across a fleet of anchored ships which has no defense whatever against the enemy. If you were to ask any of the bombers of the attacking air force he would bear out the above statement and tell you that from his point of view he had every possible condition in his favor.

To particularize, we may mention, first, that the most successful approach to the target is one that is made with the target dead to windward, and in every case during the three days that we were witnesses of the bombing, the attack was made up the wind. In an actual engagement such freedom of choice would not be possible.

Secondly, each flight of planes was permitted to pass over the target and withhold its bombs, if the captain did not consider that the position was ideal for releasing the bombs; in fact, a flight would sometimes pass two or three times across the target before it had made the necessary corrections and considered itself in the best possible position. This, of course, would be impossible in actual battle, where the opposing enemy craft would be in the air and a barrage of anti-aircraft shrapnel would be built up against the attack.

Thirdly, the attacks were made only in favorable weather. Low-lying clouds, a heavy haze and the approach of twilight were sufficient to call off the operations. In wartime, of course, the attacking force would have to take its chances of adverse wind and weather and poor visibility.

Fourthly, the targets were anchored—a point of immense advantage to the bomber, when using his sights from the plane above. In an actual fight battleships would be moving from 17 to 25 knots an hour, cruisers from 25 to 35 knots, and the quick helm, which characterizes all modern warships, would enable a ship to make a change of course as soon as she saw the bombs let loose by the enemy. Zigzagging may well prove to be one of the mot effective defenses against aircraft bombs, particularly against those which are launched from high altitudes.

Lastly, there were no opposing craft in the air. The fast fighting scout is master of the heavy bombing machine and, unless the latter is protected by her own scouts, she will be sent down before reaching the target.

Having cleared the air by the above statement of the favorable conditions under which the attacks were made, we hasten to state that the work done against the *Frankfurt* and *Ostfriesland* was excellent. The army and navy bombers are to be congratulated. Due largely to the fact that they were working off an old stock of English bombs, a large percentage of the navy shots proved to be "duds," and consequently their work did not make such a dramatic showing as that of their confrères of the army. We remember one navy flight which let fall half a dozen bombs that formed a beautiful pattern around and on the *Frankfurt;* but not one of these bombs detonated. Without having the exact figures at hand, we think it is safe to say that fully 50 per cent of the bombs either made direct hits upon the target or dropped sufficiently near to have a damaging effect upon the submerged hull of the ships. When we remember that air bombing is, even to-day, a comparatively new art, and that the sighting instruments are considered to be in the experimental stage, we feel justified in predicting that before many years have passed, bombing from the air, even at much greater altitudes than

the 1500 to 1700 feet employed in the recent tests, will take on something of the accuracy of gun-fire. It should be remembered, furthermore, that about the last man to play safe in warfare is your air pilot. After seeing a single 2000-pound bomb crushing in the underbody of a battleship as though it were an eggshell, it is certain that under the stimulus of a great battle, upon which the fate of a nation depends, there will be found many an airman who will not hesitate to dive down at 200 miles an hour, until he is within point-blank range, and place his bomb in just the right position alongside the enemy to sink him, and sink him quickly.

During the tests of July 18th against the *Frankfurt*, which we witnessed from aboard the battleship *North Dakota*, at a distance of 1800 yards from the target, it was clearly demonstrated that however much destruction bombs of 250 to 600 pounds' weight might work if they made direct hits upon the ship, they would not suffice to sink her. It was easy to determine a direct hit from one alongside the ship. In the former case there would be an enormous burst of dark-brown smoke, centered in which would be a huge splotch of red flame 50 feet in diameter in the case of the larger bombs, which would be followed a few seconds later by the snappy, snarling report which is characteristic of high explosives. Sometimes, at the burst, the surrounding water would be flecked with the splash of fragments of shell and the shattered woodwork of the ship's decks. More often, when the smoke had cleared away, it would be impossible to detect any material damage, even through the most powerful glasses. The most dramatic hit and the one with immediately visible results was made by a 600-pound bomb which passed through the superstructure deck of the *Frankfurt*, amidship, and by the force of its explosion lifted the deck and bent it over the side of the ship. As we looked at this through the glass, our thoughts went back immediately to the sinking of the *Maine* and to the remarkable way in which the foredeck was lifted up and curled back upon the super-structure in the great explosion at Havana. The bombs failed to penetrate the protective deck of the *Frankfurt*, and apparently did no great harm to the shell plating of the ship above water. They failed to start any serious leaks during the first several hours of bombing, and this in spite of the fact that the later bombs dropped were of 600-pound weight. So well did the cruiser stand up under this attack that it began to seem doubtful whether she would be sent down before the day was over. The fatal blow was delivered on the starboard bow and not far from the ship's hull. The detonation was heavy, the hammer blow of it being felt through the water by our ship which at the time was over 2000 yards distant. There was a big upheaval of water which fell mainly across the ship, and when it had rained off, it was seen that the bow was steadily settling and the stern rising above its normal flotation mark. Twenty minutes after the fatal bomb had crushed in the side of the *Frankfurt*, she disappeared.

The program of the attack upon the dreadnought *Ostfriesland* called for bombing first with 300-pound and then with 600-pound bombs. If these failed to sink the ship, she was to be bombed with 1000-pound bombs. If she were still afloat, an attack with a specified number of 2000-pound bombs was to be made. If she survived these, the *Pennsylvania*, flagship of the Atlantic fleet, was to try to put her under with salvos of 14-inch shells at a distance of not less than 18,000 yards or nine nautical miles. If the resistance of the ship was equal even to this final test, a squad from the *North Dakota* was to go aboard, place large charges of T. N. T. on her bottom and sink her. The confidence in the modern system of anti-torpedo and anti-mine internal construction was such that there were a large number of officers and men of the fleet who believed that, battered as she might be in her upper works the *Ostfriesland* would succumb only to the well-placed salvos of the *Pennsylvania*.

To get the full significance of the sudden destruction of the *Ostfriesland*, it should be clearly understood that in respect to internal subdivision she was a well-protected ship, completed in 1911. Since the surrender to the German fleet, expert officers of the British and our own navies have made a thorough examination of German battleship construction, and it is agreed that in underwater subdivision as a protection against mine and torpedo, the Germans were somewhat ahead of contemporary ships. The *Ostfriesland* is by no means out of date, as may be judged from the fact that she was a contemporary with the latest of the British 12-gun and the earliest of the British 13.5-gun dreadnoughts, and also with our own dreadnoughts *Utah*, *Florida*, *Arkansas* and *Wyoming*. Within her outer shell she had longitudinal bulkheads, including one armored bulkhead of a tough, ductile steel, designed to bend without breaking under the impact of high explosives. Such at least was the design, and as far as we know she was built accordingly. At any rate, the *Ostfriesland* has it to her credit that in the flight back to Germany after the battle of Jutland, she struck a mine and nevertheless reached port under her own power. A sister ship is credited with having received during the same battle the blow of four 15-inch British shells, in addition to being twice torpedoed. This vessel also reached port. An important feature in her construction, which is of great importance in considering the quick sinking of the vessel, is that her bulkheads were not pierced by watertight doors; in other words, communication from compartment to compartment was "up and over." It is the consideration of these facts which leads us to believe that the 2000-pound bomb which was detonated a few feet from her port quarter must have opened up a section of the underbody of the ship far greater than would have been blown in by the detonation of a torpedo or a mine.

The bombing of the *Ostfriesland* was set for Wednesday and Thursday, the 20th and 21st of July. Due to unfavorable weather conditions, the first attack did not start until noon. It was carried out with 600-pound bombs which were well placed, some of them aboard and some not far from the ship. After two direct hits, the destroyer *Harding*, from which we observed the test, steamed in alongside the *Ostfriesland*, and even from the distance of 100 yards, it was impossible to note any external effects from these explosions. They had penetrated the upper decks and burst above the protective deck—which, of course, they failed to affect. On reaching the scene of operations on the morning of the 21st, it was noticed that the *Ostfriesland* was about two feet down at the stern, and it was evident that a slow leak had been developed by the bombing of the previous afternoon. During the early morning of the 21st, attacks were made by five army Martin bombers, which dropped 1000-pound bombs. These failed to make any appreciable difference in the submersion of the ship. It had been intended to try the penetrative effect of 14-inch naval shells dropped from naval bombers, but, due to a change of program, five Martin bombers and a Handley-Page machine came out from Langley Field carrying 2000-pound bombs. Orders had been given to endeavor to place these outside of the ship and as near to her hull as possible. The work of destruction is believed to have been done by two of these half-dozen bombs—namely the fourth and fifth. One of these landed close in on the port side of the vessel, not far aft of amidships, and the second close in on the port side of the stern.

The destroyer *Harding* was about two miles distant from the stern and directly in line with the longitudinal axis of the ship. The delayed-action fuse of the second bomb must have worked admirably and have burst the bomb well down below the surface; for it lifted and dropped upon the ship an enormous quantity of water, which, from our point of observation, completely hid the vessel from sight. As the finer mist disappeared we noticed that a perfect Niagara of solid water was pouring

down from the bridge, the conning-tower, the after turret and the quarter-deck. When this had fallen clear, there appeared all around the water-line at the stern of the vessel and well up toward amidships, a white line of foam boiling around the vessel, broken occasionally on both sides of the stern by bursts of foaming water.

There was but one interpretation of this phenomenon. It meant that not only the port side, but also much of the bottom of the ship must have been broken in and that this disturbance was caused by the escape of vast volumes of air from the wrecked underbody as the water rushed in. Immediately, the great ship began to list to port, turning steadily over as the afterbody of the ship submerged. When the bow of the vessel struck the bottom some 300 or 350 feet below the sinking was arrested, and the ship seemed to hang for a few moments before the stern took the final plunge and disappeared. Just after she had gone down, the Handley-Page bomber flew over the circular patch of still foaming water, and dropped the last of the 2000-pound bombs, thus sounding taps over this marine burial.

It is not to be wondered at if, to the lay mind, this majestic spectacle should have had but one immediate meaning, and express itself in the all-too-common phrase: "That seals the doom of big battleship construction." As a matter of fact, it means nothing of the kind. Naval and military men knew perfectly well that 1000 pounds of T. N. T. detonated near the side of such a ship as the *Ostfriesland* would be pretty certain to send her down. Whether it would have done the same to the flagship *Pennsylvania,* which floated not far away, is a mooted question. Subdivision has made wonderful strides in the last ten years. That bomb might possibly have sunk the *Pennsylvania.* It is certain that it would have put her out of action for the time being.—*The Scientific American,* 6 August, 1921.

BATTLESHIPS WILL SOON BE THINGS OF THE PAST.—The President ordered the recent experimental attacks by flying machines on battleships. He has given time and work to the important fact that war in the future is to be settled in the air. His orders have caused the making of huge 6000-pound aerial bombs and other experiments in air fighting. This is the only fighting, except submarine fighting, that will play any important part in future wars.

This country created the flying machine and this country can be made invulnerable, safe from all attack, by the flying machine. The President will see to it, for his mind accepts new ideas.

In 50 years there has been no news as important to this country as that describing the destruction on Thursday of the German fully armored dreadnought *Ostfriesland.* The great battleship was sent to the bottom in 25 minutes by two bombs. They did not touch her, simply fell in the water near her and destroyed her by the impact of the water itself forced against steel armor with sufficient force to open the seams and sink the boat.

The *New York Times,* reporting the destruction by two inexpensive bombs of a ship that cost millions, quoted General Williams:

"The bombs that sank her will be heard around the world."

The *Times* asks: "Is the battleship obsolete?"

It is *indeed* obsolete, as has been said in this column many times during the past two years.

To build $40,000,000 battleships is a stupid waste of money, done only to please shipbuilders that want money. The entire engineer and mechanical intelligence of this country should be devoted to flying machine construction.

The President is to be especially congratulated upon the fact that army and navy arsenals under his control are manufacturing bombs three times as great as the 2000-pound bombs that sank the German dreadnought. These bombs carry each 4000 pounds of T. N. T.

This country should have as quickly as possible 4000 first-class flying machines to carry the mails in time of peace and drop bombs upon the enemy in case of war. Five thousand flying machines would make any attack by a foreign fleet preposterous. The 5000 machines *honestly* built, without aid from grafting $1-a-year patriots, would cost less than *one* $40,000,000 battleship and could destroy a thousand such ships, if possible to build so many.

The battleship has gone by, a joke. The President *knows* it. Under his direction the postmaster general, Mr. Hays, can and will produce and use flying machines that will take care of national protection with a good fleet of submarines to back them up.—*Seattle Weekly News*, 29 July, 1921.

AIRPLANE BOMBING OF IDLE SHIPS.—Those army and navy aviators are not making even half a test in their bombing of the old German warships. When their experiments have been completed and the sum total of the things done is made public, we shall really know little more about the actual practicality of that form of wartime attack than before the "demonstrations" began.

For, be it noted, the "enemy" is not taking any part in these "attacks." The aircraft find it an easy matter to sail about over the undefended vessel of the sea and drop bombs in its direction. There is no real practice in avoiding the foeman's anti-aircraft fire, yet this would be the vital phase of any undertaking to sink a battleship from the air in time of actual combat. Everything is in favor of the aerial "attacks" in the present experiments, yet not more than 25 per cent of the bombs dropped have proved effective. How much smaller would be the percentage of hits in the event of the assaulting party being met by fire from the battleships—easily better directed and therefore more dangerous to meet?

In a conflict between sea and air forces, the advantage will always be with the former. It presents a better target to the attacking party than does aerial craft, to be sure, but at the same time it can far more skillfully fight back. The airplane must be always moving at high speed, and over an ever-changing course, in the effort to avoid the guns from the water. Thus the airman's own accuracy of aim is weakened. The more successful he is in escaping shots from below, the less will be his own chance of scoring against that enemy. The latter, having a far greater deck surface on which to operate, can concentrate many guns upon the enemy in the air.

None of these actual phases of real warfare have had to be encountered in the tests off the Virginia Capes save in merest theory. The attacks have been made under the most favorable circumstances possible. It is not much of a hazard to say that, under necessity of protecting themselves from ever-present danger of destruction from below, the airmen would have been able to accomplish little against the battleships of the sea. The "eyes of the navy" are not yet particularly vampirish.—*The St. Louis Times.*

THE BOMBING TESTS.—The navy tests which were held off the Atlantic capes terminated July 21 with the bombing and sinking of the ex-German battleship, *Ostfriesland*. There was considerable good-natured rivalry between the man-o'-war's men and the air service respecting the merits of battleships and aircraft, out of which grew the popular belief that the tests would determine whether or no the battleship must yield to the airship as a warfare weapon and the former, in the near future, be consigned to obsolescence.

But whatever the views of the rival factions, the fact remains that both sides are now pretty well agreed that we cannot yet dispense with battleships and that the airship has proved itself to be a valuable auxiliary in the defense of our coasts.

Secretary of War Weeks, remarking on the ideal conditions which prevailed, and the fact that the ships were moored, declared: "This all means that the value of the aeroplane as an offensive weapon was not absolutely proved. The delayed explosion seemed to be the most effective and the development apparently will be in the perfection of bombs that work on the depth charge principle and are able to pierce warships below their heaviest armor line." General Menoher, chief of the army air service, said: "I have always contended that the bomb did constitute a very grave menace to the capital ship and that extraordinary precautions had to be taken to meet the menace." Secretary Denby stated that "scientific conclusions of the utmost value undoubtedly will result from the series of tests," and Assistant Secretary Roosevelt summed it up saying: "The aeroplane has proved its value as an auxiliary of the navy. They will be extremely useful in the future for information work and in harassing the enemy. I do not believe that they spell the doom of the capital ship. That has been predicted three times in my lifetime. The torpedo, the submarine and the aeroplane all have been hailed as weapons to make dreadnoughts useless. What I think will happen will be steps by the navy to meet the new form of attack. Aviation will have to be developed in conjunction with the fleet."

It seems that the best form of aeroplane attack on battleships would be a combination of direct hits which would demoralize the personnel of the ship, together with shots laid close to the hull for the purpose of sinking. In the case of the *Ostfriesland* a heavily armored vessel, these outside shots seemed to be the most effective. Of course, it is to be borne in mind that in all these tests the targets were stationary, and the effect of anti-aircraft gunfire could not be determined. Atmospheric conditions were perfect.

That aeroplanes can terribly harass an approaching enemy fleet was demonstrated to the entire satisfaction of every witness of the tests, and this in itself supplies a powerful plea for perfection of the air service. In addition, it is made apparent that the government should encourage in every way in its power the development of the aeroplane industry in order that America, where the plane was invented, may take its place in the lead, instead of trailing France, Great Britain and Germany as at present."—*The Marion Star.*

"THE NAVY THAT FLIES."—An airplane can sink a battleship. Three 2000-pound bombs sank the *Ostfriesland* in 25 minutes. Two of these bombs striking alongside ripped her steel seams and she opened up and sank like a wet paper box.

She cost $30,000,000, or would cost that to-day. The planes that sunk her would cost $20,000. The Republic of Andorra could afford a war plane that could destroy the battleship *Pennsylvania* or a super-*Hood!*

The tests off Norfolk have one sure result—there will be intense activity on the part of every principal power in designing and building fleets of "bombers." Here is a means of defense within reach of the most pauperized political group calling itself a country.

The important question is, What will we do about it? We were the inventors of the submarine and the airplane. Holland's submarine was developed abroad. The airplane saw its greatest development outside of America.

Granting that the nations fail to disarm or that disarmament is partial only, will we, if attacked in the future, as in the last war, spend and waste hundreds of millions on abortive aerial programs conceived in ignorance and executed in haste?

There is danger that we will conceive the idea that by a sort of a winged T. N. T. miracle off the Virginia Capes we are from this day on immune

from foreign attack. Our first mistake is that the battleship has become obsolete over night. Our second is that, if a hostile fleet approaches, all that will be needed is to send up a few planes laden with bombs and about 100 miles off the coast blow the said foreign fleet into steel shreds.

Which is hardly the way it would work out! In the first place, the battleship is likely to undergo certain revolutionary changes and perfect itself in means of defense. Also, such hostile fleets would approach carrying a fleet of "wasp planes" on its deck. It would not take many of these to be superior to our entire present plane equipment. Small single-seater fighting machines these are; a dozen of them can ride on an ordinary battleship, and an airplane carrier will "mother" a hundred of them. The big, lumbering, well-nigh defenseless bombers will be brought down with the same ease and dispatch that they were on the West Front.

No, the problem of defense is not solved. The idea is born. The job now is to get on with it. Our problem is a defense problem and the tests off the Norfolk base have given us our clue. On a purely defensive problem we have an enormous advantage if we will build ourselves an adequate flotilla of bombers and protect them with fast and agile combat planes.

We have been building battleships for defense, since they and the submarine were the only tried methods of keeping possible hostile fleets from our shores. The tests off the Virginia Capes have established the airplane as a new, if not the most dominant, factor in the equation. Certainly as a defensive weapon they must be given strong consideration.

With the battleship proven vulnerable, the obvious thing to do is lessen the pressure on big ship building and use that pressure on developing aircraft. Three modern battleships cost $120,000,000. With $100,000,000 of this amount we can begin to get somewhere with an adequate airplane coast defense. Battleships, in building, should be so modified that they can carry a complement of air fighters.

We shall need to spend this money with craft and cunning. We don't want to follow in our footsteps of the Great War and spend $600,000,000 for next to nothing in results.

Immediately, the government should start a program of experimentation with "bombers" and combat planes to protect the "bombers" while they work. There are several questions to be cleared up, one of these being whether or not the Martin "bomber" now in use is the best for the purpose. Students of the inventor of the biplane, Octave Chanute, assert that the biplane is wrong for "bomber" types; that it offers a larger target than the triplane; that it depends on a single set of control surfaces, where these should be in duplicate, and that its structural strength and ability to withstand shell or machine-gun fire is not sufficient. This "school of airmen" hold by the triplane and quadruplane as the better "bomber" types.

These are technical questions, but they are of interest to the public that pays the bills. These and others can best be solved by building aerial "bombers" of many designs and giving them rigorous tests. Automatic planes, small airplanes of the types proposed, can be made to fly at suitable altitudes without an aviator aboard as targets. When these are subjected to bursts of high explosives and machine-gun fire, to "air shock" and shrapnel, we will know more about anti-aircraft gunnery as well at the best type of plane.

It will be necessary to encourage private initiative. Somehow things do not get themselves done in "bureau land." We have Wright, Curtiss, Martin and others of known ability who should be assured of encouragement and support. We repeat that the mistakes made in the Great War should be taken to heart.

The tests off Norfolk mark the beginning of an epoch. Experimentation should go on. We need to know more, much more, but we have been

given a glimpse. The bombs that sank the *Ostfriesland* are echoing around the seven seas.—*The Philadelphia Ledger.*

"Plane to fly like a bird" is the caption of a story appearing in *Engineer and Iron Trades Advertiser,* of Glasgow, of April 19. According to the story, the new "pulsating" wing of the Austrian scientist, Professor Raimund Nimfuhr, promises a vista so wonderful that our whole conception of the place of aircraft in the scheme of transport may have to be altered.

The basis of the theory, it is stated, has just been investigated by experts of such reputation as Herr Schwengler, chief of the Zeppelin works, and Herr Skopik, head of the designing staff of the Fokker works, and both believe that Nimfuhr is going on the right lines.

To come to details, the Nimfuhr principle is to imitate mechanically the methods of nature in the wings of birds and insects. The Nimfuhr "pulsating wing" relies upon an extraordinary rapid vibrating or stroke action upon the cushion of compressed air which is formed in flight beneath a sustaining plane.

The actual Nimfuhr wing as constructed for a full-sized machine will, it is understood, be hollow with a flexible membrane on the under side. By pneumatic mechanism this membrane is set pulsating or vibrating with such rapidity that waves of atmospheric pressure are generated which, it is intended, will not only sustain but also propel the machine. There is also a system whereby the extremities of the wings can be extended or contracted by pneumatic action to produce results such as are obtained by birds in stretching or folding their wings. Another feature is an automatic stabilizer, in which disturbances of balance set in motion levers which counteract, by their movement of the wings, any tendency of the machine to lose its equilibrium. Experts are looking forward to the building of the full-sized machine on this principle.

Even more significant, it is pointed out, is the interest financiers are taking in the promise the Nimfuhr method offers of so reducing the power necessary to drive aircraft that aerial transport can be made cheaper than earth transport. If Professor Nimfuhr's claims are substantiated in large-scale work, it is calculated that a trans-ocean craft built on this principle, and carrying several people, would be so economical in power that passengers could be carried by air between Europe and America cheaper than in a steamship.—*Aerial Age,* 18 July, 1921.

THREE HUNDRED AND TWELVE MILES AN HOUR CLAIMED FOR HELICOPTER.—The Hague.—Dutch agents here are exploiting a new helicopter invented by a German named Hanschk which, it is predicted, will revolutionize aviation.

The helicopter makes 500 kilometers (312½ miles) an hour, can ascend and descend vertically, remain stationary in the air and cannot fall, it is claimed.

Hanschk declares he could fly to New York in one day, and is convinced that, if financed, he could win the $1,000,000 prize for a flight around the world.

Colonel Williams, chief of the British Aviation Commission, who saw a model in Berlin, considered it a most wonderful invention and expressed amazement.

Allied restrictions prevent Hanschk from constructing his invention in Germany now, but during the war the German War Ministry forbade Hanschk to offer it to any foreign country, although unable to use it as the adoption of the helicopter would have meant reorganization of the flying corps.—*Aerial Age,* 18 July, 1921.

SOW SEA MINES FROM AEROPLANE.—Washington.—Another new war development that has just been perfected is a plan whereby the ocean can

be strewn with contact mines by the use of aircraft. The plan has been tried by American Navy experts and found to work perfectly. The result is that mine laying may become a matter of a few hours' work when an emergency arises, instead of days being required to close up lanes of navigation menaced by enemy ships.

The experiments were conducted in Chesapeake Bay. The mechanism, which was invented by Charles Lee, a mechanical engineer of Portsmouth, Va., consists of the usual mine, an anchor, cable and silk parachute. The plane carries the mine to the point desired, and when it is dropped the parachute eases it into the water. The instant the mine strikes the water, the parachute is released, and it floats away to sink from sight in a few minutes, leaving no trace to give the enemy warning of the proximity of danger.

According to the experts, a fleet of aeroplanes, each carrying a supply of mines, can be sent over the area it is desired to mine, and there drop the mines at regular intervals. The whole area can be mined within a very short time, and the planes be away before being sighted by enemy ships and their mission discovered. This, according to the navy experts, is one of the best and quickest means yet discovered of protecting a coast against enemy craft. The fields can be mapped for the protection of home craft as easily as it can be done with the usual method of laying mines from ships.

Another important development in the matter of aviation has been reported to the government experts from Pittsburg. It is the discovery of the alloy used by Germany in the manufacture of the frame-work of the big Zeppelin dirigibles. This formula has been long sought by both American and British scientists, and it was one point in which Germany was far ahead of the rest of the world throughout the war.—*Aerial Age*, 18 July, 1921.

INTERESTING NIGHT FLYING EXPERIMENTS.—Aviation experts are still following the example of pioneers like Wilbur Wright in learning from birds how to fly. Now they are taking hints from that stunt-flying expert, the bat, in order to make night flying safer, and experiments already show progress.

Bats can avoid obstacles they cannot see. Experimenters in England blindfolded several bats and release them in a room which was crossed by many wires and divided from another room by a grid containing holes just big enough for a bat to fly through. The bats never touched the wires, and flew through the holes with ease.

The experiment revealed the bat's secret. He emits a continuous note, often inaudible to man's ears. This sound bounds back from any barrier, conveying such accurate information to his sensitive ears that he can map out the space in front of him without any uncertainty.

It is now thought the aeroplane may do the same thing. Instruments are being devised so sensitive that they will record visibly and before the airman's eyes the progressive increase of such sounds as ground or any other object is approached. Information would be supplied equally well in the dark or in mist, and since sound travels twelve to fourteen times faster than the fastest plane, the warning would come in plenty of time to avoid accidents.—*Aerial Age*, 18 July, 1921.

FIRST AIR DEFENCE STATION ON U. S. COAST COMPLETED.—The first complete modern aerial coast defense station has just been finished at New Dorp, S. I., and will be turned over officially to the United States Army Air Service as a unit in the national defense next week. It will be designated Miller field and is completely equipped for handling land as well as seaplane patrol aircraft.

It is on the old Vanderbilt estate and covers approximately 450 acres. For seaplane purposes the new field is complete in every way. It has a frontage of 1750 feet along the ocean, which is protected by a huge pier at one end, and a concrete ramp at the other, the two breakwaters forming a haven for the seaplanes, as well as affording smooth water for taking off and landing.

The beach is equipped with a marine railroad for hoisting seagoing aircraft ashore either for repair or housing. For land machines the field is so arranged that they can alight in any direction, according to the direction of the wind. The field itself is rectangular in shape, and is surrounded by the permanent buildings that form part of the station. Aeroplanes have a clear running space of 3200 feet in one direction and 1625 feet in the other.

The station is named in honor of Captain James E. Miller, who was killed in action near Corbeny, France, on March 8, 1918. Captain Miller was a member of the 95th Aero Squadron.

In addition to complete facilities for handling all types of aircraft, the new station is equipped with an independent wireless transmitting and receiving station. There is also a radio direction finder that will enable aircraft to locate the station in foggy weather, and guide them in their coastal patrol work.

It was constructed upon plans completed in the closing stages of the war, and its cost came out of appropriations made for war purposes. The function of turning the station over to the Army Air Service from the constructing quartermaster's department will be informal. The new station will be under jurisdiction of the commander of Mitchell Field, L. I.—*Aerial Age*, 18 July, 1921.

NAVY'S AIRSHIP LARGEST IN WORLD.—Some idea of the size, speed and carrying power of the new navy dirigible, *ZR-2*, may be gained from figures made public yesterday by the Navy Department. The giant airship, built in England originally as the British *R-38*, will leave her hangar at Howden, England, August 25, for her transatlantic flight to the United States.

The largest airship ever constructed, the *ZR-2*, has 500,000 cubic feet greater capacity than the German Zeppelin *L-71*, built late in the war period for the avowed purpose of bombing New York. The total length of the *ZR-2* is 700 feet, her greatest diameter 85 feet, and height from the bottom of suspended cars to the top of the bag is 92 feet. She is approximately 2,720,000 cubic feet in capacity and has a lifting power of about 85 tons gross, and a disposable lift of approximately 45 tons, which consists of gasoline, oil, crew, cargo and armament.

The ship is installed with six 350-horsepower Sunbeam Cossack motors, which generate a full speed of 75 miles an hour. The cruising speed of the craft is 50 miles an hour. She carries 10,400 gallons of gas, which gives a cruising radius of 6000 miles at full speed and about 9000 miles at cruising speed. The propellers are equipped with reversing gear which enables the ship to check speed at will or even fly astern.

Control of the dirigible is situated on what is similar to the bridge of the ship. The captain directs the course exactly as does the captain of a seagoing vessel.

The communication system consists of engine-room telegraphs, ship's telephones and voice tubes. The ship is equipped with a radio set with a sending radius of about 1500 miles.

If *ZR-2* were to land in front of the Capitol in Washington, there would be just 25 feet of the Capitol building extending belond the nose and tail of the ship. If she were stood on end by the Washington monument, the tail of the ship would be 150 feet higher than the top of the monument.

If the outer cover were spread on the ground, it would cover a 4-acre plot. The gas bags which contain the hydrogen gas are lined with gold-beater's skins. There is but one gold-beater skin to each cow that is slaughtered. There are 600,000 of these skins used in lining the gas bags of *ZR-2*.

The structural strength of the ship depends a great deal upon piano wire used as stays and braces. If all the piano wire used in *ZR-2* were put end to end in one string, it would be 60 miles long.

The crew consists of a captain, executive officer, navigator, engineer officer, radio officer, meteorological officer, three watch officers, sixteen mechanics and ten riggers. The crew's quarters are located in the keel-way. The quarters are equipped with comfortable chairs, tables, benches and a Victrola with a good assortment of records. The bunks are placed along the keel-way at varying intervals. Each bunk has, in addition to a good mattress and blankets, a fur-lined sleeping bag.

Each power car is equipped with a cooking arrangement, which consists of a lead from the exhaust pipe of the motor to the cooker. The hot exhaust flames are brought in contact with the bottom of the vessel in which the food is being cooked. The hot food is served on the tables in the crew dining rooms.

Navy officers are much worried about how long they are going to be able to operate the *ZR-2*, the great rigid airship bought from England and due to arrive in the United States the latter part of this month. They are afraid they are not going to have money enough to keep the airship going very long and at the same time keep up the airplanes with the Atlantic and Pacific fleets.

There are no accurate estimates as to what it is going to cost to operate the *ZR-2*, since no warship ever has been in the possession of the government. It is known, however, that the cost of maintenance will be great, since it is necessary to have a crew of 500 men to get it in and out of the hangars alone. The other expense comes from the fuel and the helium and hydrogen used in the great body of the craft.—*The Washington Post*, 8 August, 1921.

THE "L.F.G.-V3A" FLYING BOAT.—The *L.F.G.-V3a* flying boat is a rigid truss monoplane passenger machine, produced during 1920 by the Strelsund Works of the Luft-Fehrseng-Gesellschaft (L.F.G.) at Berlin. The power-plant consists of a 150-horsepower Benz 6-cylinder engine and recently a 185-horsepower B. M. W. 6-cylinder engine (Bavarian Motor Works). The hull is of very great span, and no side-floats (auxiliary-floats) are used. The hull, the enclosed cabin, the ailerons and the tail (tail-plane, elevators, fin, rudder) are of duralumin metal construction. The ailerons, the elevators and the rudder are of the balanced type. Three or four passengers can be carried. The main dimensions, weights and performances are the following:

Engine	150 h. p. Benz or 185 h. p. B.M.W.
Span	14.45 m.
Length	3.50 m.
Height	2.35 m.
Wing area	30 sq. m.
Airscrew diameter	2.70 m.
Weight empty	9.70 kg.
Weight loaded	14.70 kg.
Total load	500 kg.
Wing loading	49 kg. p. sq. m.
Power loading	10.9 kg. p. h. p.
Speed	150 km. p. h.
Fuel capacity	218 ltr.
Range	600-650 km.

NEW ITALIAN AIRSHIP.—Italy has ordered the construction of a new big semi-rigid airship by the Department of Aeronautical Construction. The main features of this new airship are as follows:

Volume	42,000 cm.
Length	160 m.
Width	25 m.
Height	27 m.
Engines	12 Spa, 200 h. p. each—total h. p., 2400.
Maximum speed	110 km. per hour
Normal speed	85 km. per hour
Range	5600 km. normal speed

In addition a small semi-rigid airship for the training of pilots will be built to the following specification:

Volume	1100 cm.
Length	40 m.
Width	8.50 m.
Height	13 m.
Engines	2 engines, 35 h. p. each
Maximum speed	75 km. per hour
Range	500 km. with 4 passengers on board

The price of construction will not exceed that of an automobile *de luxe*. —*Aeral Age*, 8 August, 1921.

DENBY WANTS 30 MILLION FOR PLANE CARRIERS.—Washington.—Recommendation that approximately $30,000,000 be appropriated for construction of two aeroplane carriers will be made to Congress in the near future, Secretary of the Navy Denby announced July 25. A measure embodying such a proposal is pending before the House Naval Committee, and it is understood that the Naval Secretary will urge its speedy enactment.

Coincident with Mr. Denby's announcement, Senator King, Democrat, Utah, introduced a bill which would provide for conversion of the battle cruisers *Saratoga, Lexington* and *Constellation* into aeroplane carriers, and for stoppage of construction work on the battleships *South Dakota, Indiana, Montana, North Carolina, Iowa* and *Massachusetts* and on the battle cruisers *Ranger, Constitution* and *United States*.

Secretary Denby said he had decided on his forthcoming recommendation even before the recent bombing tests, but that the results of those tests had convinced him that the navy needed more aeroplane carriers. Senator King, addressing the Senate in behalf of his bill, said that the bombing tests had demonstrated conclusively that "too much importance" had been attached to capital ships and too little attention devoted to aircraft and submarines.

Secretary Denby indicated that in his opinion it would be wise to construct two new aeroplane carriers, one for the Atlantic fleet and the other for the Pacific forces. Two carriers were provided for in the current naval appropriation bill as it passed the Senate, but the House refused to accept the provision and it was stricken out.—*Aerial Age*, 8 August, 1921.

NEW RULES PROHIBIT ARMY "STUNT" FLYING.—Washington.—Aroused by the fatal accidents occurring as the result of aeroplanes doing "stunts" over holiday crowds, the War Department has issued general orders restricting flying over towns and prohibiting "stunt flying" over crowds except under unusual conditions. Practically the same general rules apply to lighter-than-air craft.—*Aerial Age*, 8 August, 1921.

MANUAL ON NAVY AVIATION.—In order that line officers of the navy may have an opportunity to study aviation, the Bureau of Navigation has approved the plan for the compilation of a manual on the general subjects of aviation, organization, activities, aeroplanes, engines, equipment, use aboard ship, and other details. When this manual has been compiled and approved, it will be issued to the line officers of the navy, and thereafter questions on aviation based upon the general subject as treated in the manual, will be part of the examination of line officers. The plan is now under way, but it is not expected that either the manual or the questions for examination will be ready for issue much before the first of next year, or possibly later. A tentative series of questions was submitted to the Bureau of Navigation as an outline of the subject which should be covered in the new manual.—*Aerial Age*, 8 August, 1921.

AERIAL PATROL OF SEA LANES.—Acting Secretary of the Navy Roosevelt has asked the House Committee on Naval Affairs to include in the Legislative Naval bill for 1921, a proviso "that naval aviation shall have cognizance of the aerial operations necessary to gain and excerise command of the sea and of such stations and craft as are necessary to insure adequate aerial patrol of the sea lanes for these purposes." Under existing law dividing aerial responsibility between the two services, the navy is not charged with keeping open the sea lanes for coastal shipping. This, says Mr. Roosevelt, "is an integral part of the navy's duty and was the major work it performed in aviation during the late war. The navy's development of aircraft is towards types that can perform this duty. In war time the navy will have to and should do this work and the army will not have suitable planes for it, and, moreover, the army will be occupied on its legitimate function, the land defense. It is extremely desirable as a matter of national policy that Congress fix responsibility by law for the defense of the United States in conformity with the approved plans of the War and Navy Departments as promulgated by the Joint Board."—*Aerial Age*, 8 August, 1921.

NAVIGATION AND RADIO

A VOYAGE OF RESEARCH.—The little vessel, the *Quest*, of some 200 tons net, which is to sail in August under the command of Sir Ernest Shackleton, will undertake scientific research among the lesser-known islands of the Atlantic and Pacific Oceans and the uncharted seas of the Southern Polar regions. A full hydrographical survey is to be made and the equipment of the vessel includes a specially constructed seaplane. It is hoped that the result of this voyage of exploration and discovery may be to clear up the many doubts which have arisen about certain portions of the Antarctic regions, and it is understood that a special search will be made for the islands of Tuanati and Dougherty. The latter might, it is thought, prove a useful site for a wireless station to bridge the gap between New Zealand and South America.—*The Engineer*, July, 1921.

STEERING BY WIRELESS.—Perhaps the most important feature of the recent airplane bombing tests off the Virginia Capes was one to which hardly any attention was paid at the time. It was the maneuvering of the battleship *Iowa*, far out at sea, without a man on board. The ship was steered by wireless from the coast.

This, as the Elmira *Star-Gazette* says, marked a big step in one of the most remarkable developments of modern transportation. Small vessels have been steered in this way before, but it appears to have been the first time the process was applied to a craft as big as a battleship, and also the first time the mechanical maneuvering was done at so great a distance.

The application of this new art to future warfare is obvious. If warships can be directed accurately by wireless, their fighting possibilities are greatly augmented, because they can be sent against a fort or a hostile fleet without any risk whatever to human life. Torpedoes can be steered in that way, and small craft loaded with ammunition can be used as torpedoes, and sharp-prowed craft can be used to ram large craft. It may be possible eventually to handle a battleship or cruiser similarly in all of its fighting operations, steering it and aiming and discharging its guns and torpedo tubes by wireless, besides using the vessel itself as a ram.

The process can be applied to aircraft, too. Therein, perhaps, are its greatest possibilities. Aircraft offer the greatest menace to warships, but air-fighting is extremely risky for the flyers. If an endless process of bombing planes can be sent over a hostile fleet, flying straight and dropping their missiles without any human operator to suffer fear or death, what chance will the warships have?

We may even see battles between purely mechanical aircraft, eventually, or between rival fleets of wireless-directed aircraft. That would be the logical end of the present armament tendencies.—*The Courtland Standard.*

WEATHER BUREAU OFTEN FURNISHES CLUE TO DISAPPEARANCE OF SHIPS AT SEA.—Widespread interest has been aroused by the disappearance while at sea of ten or more vessels and their crews within the last few months. This strange vanishing without trace at first led to the circulation of the wildest reports. One ascribed the loss of these vessels to a pirate ship, another to an oil-fired submarine chaser, while from Paris came the story that an insane man in a U-boat—a regular twentieth century Captain Kidd—was to blame. All these yarns were exploded by officials of the United States Weather Bureau, which proved that the vessels were lost in severe storms.

Knowledge Quite Recent.—This is only one example of the useful work performed by the marine meteorological branch of the Bureau. One hundred years ago little was known of the laws that govern weather conditions on either land or sea, and only experience taught the mariner that in certain regions of the ocean the winds were fairly steady from a given direction, while in other regions they were much less to be depended upon.

During the early half of the nineteenth century, especially in the 20 years following 1830, many of the mysteries of wind movements were at least partly solved. Observations made in log books of vessels that passed through identical tropical storms were brought into relation with each other by students, and thus the whirlwind motions of the disturbances, or "meteors," as they were then called, were established.

It was M. F. Maury, an officer of the United States Navy, who finally invited the "co-operation of American shipmasters in making daily, in all parts of the ocean, as they pursue their voyages to and fro, a series of meteorological observations."

More than 1000 American vessels responded, and in the early fifties, from the materials obtained, Maury constructed his "wind and current" charts. Maury believed that in studying the winds, "we must look to the sea for the rule, to the land for the exceptions," and so thoroughly imbued was he with the value of taking weather observations correctly at sea that in 1851 he urged the holding of a conference of nations to take up the question of "establishing a universal system of meteorological observations for the sea as well as for the land." The marine conference at Brussels in 1853 followed, with representatives from ten governments attending. An international form on which to record observations at given hours was devised, and suggestions were made toward standardizing and correcting to precision all recording instruments in use.

Value Quickly Realized.—When the first of Maury's charts appeared, showing the normal condition of wind and weather over the oceans of the world, the marine interests were quick to realize their value, and by referring to them many a shipmaster was enabled to shorten the duration of his voyage considerably. In those days, when most of the commerce of the world was carried in sailing vessels, and the few steamers were of comparatively low power, the study of marine meteorology in relation to sailing routes was perhaps of more importance than it is at present, when many of the cargo carriers are of high power and large tonnage and ply back and forth between ports with the regularity of railroad trains.

It must be remembered, however, that even at this day a very large proportion of the world's ocean freight is carried by tramp steamers of from 1000 tons to 4000 tons, and of low power, while much of our coasting trade is carried on in sailing vessels and auxiliary schooners. To masters of vessels of these classes a study of the pilot charts should prove of value in enabling them to choose the most favorable route between ports; this being especially true in the unfrequented waters of the world.

Have Wireless Apparatus.—As large numbers of vessels are now equipped with wireless apparatus and the percentage is increasing yearly, the captains are enabled to receive weather reports from each other, as well as the official forecasts, when they are within range, thus enabling them to locate with more or less accuracy the approximate center and probable movement of any marked disturbance. In fact, from observations sent by radio, some synoptic weather maps have been made at sea and used in local forecasting.

There is one feature of marine meteorological work that has not been exploited to any great extent; yet from a purely commercial standpoint is as important as any. This might be called marine climatology, and consists in furnishing information regarding the weather conditions on any given date or period of time in the past at a certain locality.

Requests are constantly being received from ship owners and law firms for information of this sort. For example, a letter was recently received stating that a schooner sailed from a north Atlantic port on a certain date for the West Indies and had not been heard from since; and the owners requested a report on the weather conditions along the coast of the south Atlantic states and in the West Indies about the time the vessel should have reached certain points. In investigating a circumstance of this kind it might be found that the vessel must have encountered a tropical hurricane, or the records might show no unusual weather of any kind, in which case the disappearance of a vessel would be numbered among the many mysteries of the sea.

It sometimes happens that a vessel arrives at her destination with the cargo in a bad condition, and then the question arises between the consignee and the owner as to whether the damage was caused by carelessness or could not be avoided owing to the unusual heavy weather encountered. Reports received from other vessels in the neighborhood indicate the true state of the weather experienced during her voyage, and evidence compiled from these reports is frequently given in court, thus enabling a just decision to be arrived at.—*The Nautical Gazette*, 30 July, 1921.

ORDNANCE

SHORE BATTERIES VS. BATTLESHIPS.—During the past year, the U. S. Battleship ex-*Massachusetts* was dismantled by the Navy Department and was turned over to the Chief of Coast Artillery for use as a target for Seacoast Artillery. The old *Massachusetts* was laid down in 1891, launched in 1893, and put into commission in 1896. She was partially reconstructed in 1905. She had a displacement of 10,288 tons; water-line length, 358

feet; beam, 69 feet, and draft of 28 feet. Her main belt armor (Harvey) was 18 inches to 15 inches, 17-inch bulkheads, 3-inch deck, 17-inch barbettes. All of the armament and the serviceable fixtures worth salvaging were removed before the vessel was towed to Pensacola Harbor to serve as a target, but the armor was left intact.

In December, 1920, the *Massachusetts* was grounded on a sand shoal about 4000 yards off Old Fort McRae and almost half mile from the ship channel leading into Pensacola Bay. The ship was placed so that when she rested on an even keel on the sand the depth of water was equivalent to her normal draft, and so that her port main-belt armor was exposed to the fire of the guns in the coast defenses of Pensacola. Shortly after the vessel was grounded a heavy storm caused her bow to swing about the stern as a pivot through an angle of approximately 60 degrees and gave her a list to seaward of 15½ degrees. The new presentation of the ship prevented the attack of belt armor from the shore guns.

Prior to the grounding of the ship the Coast Artillery Board drew up a program of firings to be conducted against her. The program was approved by the proper authorities and the necessary ammunition and equipment sent to Fort Barrancas for conducting the firing tests.

The program included firing from a 12-inch gun fixed battery with armor-piercing shot and shell; a 12-inch fixed mortar with deck-piercing shell, both inert and explosive; a 12-inch railway mortar with deck-piercing shell, and from a 12-inch railway gun with 12-inch armor-piercing shell. In addition, 3-inch and 5-inch star shells were to be tested at night.

Early in January the Coast Artillery Board, consisting of the following officers: Maj. F. H. Smith, C. A. C., president; Maj. Quinn Gray, C. A. C., Maj. J. H. Pirie, C. A. C., Maj. L. B. Bender, Signal Corps, members, and Maj. W. B. Hardigg, Ordnance Department, temporary member, proceeded to Fort Barrancas to supervise the firings.

The program was gotten under way as soon as the weather permitted, the first firings being made from the 12-inch fixed mortar with 1046-pound shells. Three hits were obtained, one entering the forward stack at its juncture with the superstructure, emerging below the berth deck and tearing a rent of about 30 square feet area in the stack at the point of egress, continuing its way through the boiler room, and, so far as could be determined, entirely through the hull. The other two fell between the stacks on the port side of the center line of the ship. These rounds also perforated the ship.

The next series was fired from the 12-inch fixed gun battery at short mid-range. Five hits with A.P. shells were made—three forward, one in main belt and one aft. The hits forward wrecked the forward compartments on the berth deck, cutting the bulkheads and arching up the main deck, wrecking the anchor-chain locker and starting a fire in some timber work left in the vessel. The hit aft wrecked the ammunition-handling facilities of the port 8-inch turret, completely wrecked the water-distilling installation of the ship, and distorted the plates, turret barbette and base of cage mast. The shell bursts cut dozens of unprotected communication lines and did considerable superficial damage. The hit on the main belt was at a very unfavorable angle and caused practically no damage.

Armor-piercing shot were next fired from this battery. The main belt was presented at such an oblique angle that no hits were placed in it. Three hits were placed in the forward turret and two in the superstructure. The hits on the turret were not fair hits; the first, being a very oblique hit at the top of the turret, cut a groove in the turret armor and passed to sea. The second ripped open the main deck for a distance of about 12 feet and struck the turret casemate at an oblique angle. The armor plate struck was slightly displaced. The third hit cut open the berth deck, passed through the supporting beams for a distance of about 18

feet, and caused a considerable displacement of the armor plates struck when the projectile "key-holed" without penetration. In the superstructure, one shot cut through practically the entire width of the bridge deck, the other penetrated the forward stack and cut the main deck for a distance of about 30 feet, doing slight damage to ammunition hoist on the starboard side. The projectile burst and did superficial damage to thin plating about the barbette of after 8-inch turret.

Firings from the 12-inch railway mortar were next made. Weather conditions were unfavorable, and as the range was considerable from this piece, some trouble was encountered in the range adjustment. When visibility improved, however, the fire was adjusted, though a 50-mile gale was blowing aloft. Two hits were placed between the smoke stacks, one to port and one to starboard side of center line. The hit to port perforated the ship, while the hit to starboard burst just inside the belt armor. The decking on the berth deck was blown up over a considerable area. The presence of water rendered it impracticable to determine the damage below decks from this hit.

Additional firings from 12-inch fixed mortar were then made. Two hits were placed between the stacks near the center line of the ship. These projectiles penetrated below protective deck and presumably perforated the hull of the vessel.

Firings were next made from the 12-inch railway gun. Two hits forward were made before the firings were suspended. One hit burst on the main deck, the slope of which was but little different from the angle of fall of the projectile. This hit blew a large hole in the main deck and did some superficial damage. The other entered the side of the vessel just forward of the collision bulkhead, penetrated this bulkhead, which was practically detached from the sides of the vessel due to previous shell bursts, penetrated the berth deck and burst near the orlop deck, which was submerged. The detonation of this projectile opened up the seams in the side of the vessel at the orlop deck for a distance of about 20 feet, blew up the berth deck-plates over the area of the detonation, put an additional arch in the main deck and opened up a seam several inches wide between main deck and side plates of vessel for a distance of about 20 feet.

In addition to the firings from the large caliber guns, star-shells were fired over the vessel from 3-inch batteries at about 4500-yard range and from a 5-inch gun at about 6000-yard range. The shell functioned well, and when properly placed, the ship stood out boldly to observers at ranges under five thousand yards, but at greater ranges and when the line of vision from the observer to the star did not pass through or very close to the vessel, the vessel was not clearly outlined.

The purpose of the tests conducted was to determine the effectiveness of seacoast ammunition from reserve supplies against the vessel, and to confirm or to cause changes in certain policies of design of seacoast ammunition, and to determine the relative value of several types of seacoast defense weapons.

The shifting of the vessel due to action of the wind and waves prevented the attack of the main belt with any hope of perforation, so that the question as to whether the armor or projectile of two decades ago overmatched was not settled. The projectiles allotted for this part of the test were made shortly after the close of the Spanish-American War.

The firing of the high-angle weapons clearly indicated that vessels of the *Massachusetts* type have no adequate armor defense against this type of attack.

The long-range firings indicated that a large angle of fall is a great advantage in the attack of armored vessels.

In general, the firings against the old battleship confirmed conclusions drawn from the information gleaned from study of reports of damage

done by gun-fire during the World War. We can now feel more fully assured that the policies laid down for future design and supply of sea-coast guns and ammunition are sound. Furthermore, it was shown that war vessels in an attack on our land defenses are exposed to speedy destruction as soon as they come within range of the curved-fire guns.

During the past three years great progress has been made in the design, manufacture and testing of armor-piercing projectiles. American manufacturers have produced 12, 14 and 16-inch projectiles which have passed, satisfactorily, tests under specifications requiring penetration of armor-plate in condition for effective detonation at angles of impact up to 25 degrees from normal.

The ballistic qualities of these projectiles have also been so improved that, at the present time, it is possible to say that America can produce, and has produced, armor-piercing projectiles which are, so far as is known, the best in the world.—*Journal U. S. Artillery*, 21 July, 1921.

SUBMARINES.—In outlining an up-to-date program for a modern navy we must not forget submarines. We must remember that the submarine nearly won the World War for the Germans against the navies of the civilized world. It is absurd to say that the submarine was conquered. It was not. The listening device has strengthened it. New types have been developed—cruiser submarines, fleet submarines and mine-laying submarines. We must have these types. Without them our navy cannot fight a winning war.

The worn-out ideas of 1916 must give way to the demonstrated naval truths of 1921.—*The New York Tribune*, 31 July, 1921.

ERA OF THE SUBMARINES.—Admiral Reinhold Scheer, who succeeded to the command of the German High Sea Fleet early in 1916 and retained this post for more than two years, leaving it in the summer of 1918 to take over the Marine Secretaryship from Admiral von Capelle, has occupied his leisure since the war in writing on the strategy and tactics of the late campaign. His book, the "High Sea Fleet in the World War," is a useful contribution to naval literature, though its historical value suffers from the author's lack of objectivity and his striving to make propaganda. Many articles from the pen of Admiral Scheer have recently appeared in the German press, and while most of these, too, are tainted with propaganda, they are not without interest from the technical point of view. The following extracts summarize the reflections of Germany's foremost flag officer on the future of naval strategy, with special reference to the submarine:

"Now that it has become possible to achieve the principle of submersibility, naval warfare enters upon an entirely new phase. The old conditions have gone, never to return; they have been superseded by new conditions, among which is the control of the air by dirigibles and planes. The British naval authorities have themselves assisted in the development of the submarine, and in so doing have undermined the predominance of the British fleet. There is no doubt but that submarine warfare stands only at the beginning of its development; on the other hand, surface ships have practically reached the limit of their evolution. They have grown to extraordinary dimensions, but have not thereby rendered themselves less vulnerable, and they are objects of such great value that, as the strategy of the war showed, they are more to be protected than used. And so this policy of outwitting the other Powers by forcing them to build ships of tremendous size and cost has turned against its own originators. Only a few nations could afford the luxury of these giant ships, and England was always able to keep her lead over these few rivals. All the minor naval powers sank into insignificance; Britain's control of the seas seemed secure.

"The submarine upset all these calculations. The world is losing its dread of the British Navy as an instrument of war, just as it is coming to realize Britain's vulnerability in respect of damage to her sea-borne commerce. At the opening of the war Britain's first care was to avert a panic arising out of the danger to food imports. Sir Julian Corbett's book shows what herculean efforts were made to protect the ocean routes from German cruiser raiders in the Atlantic and Indian Ocean. Commerce protection became the decisive factor. Now, how much more difficult would have been the position of Britain had her enemy possessed 20 or more submersible cruisers, equal or superior in speed to our light cruisers, and sent them into the Atlantic! They would have been able to avoid attack by diving, and the bunkering difficulties under which our cruisers labored would have been absent. For the chief strength of our submarines lay in their extensive radius of action, which is due to their being able to seek safety by diving, instead of having to flee at high speed, involving heavy fuel consumption when attacked by superior forces. Particularly favorable would be the position of a country engaged in naval warfare against Britain which had outlying insular bases in the strategic areas—an asset that Germany did not enjoy.

"The disabilities of the submarine are now well understood, and the first of these is low speed. It is only when one recalls the limited number of submarines we had at the outbreak of war—viz., about two dozen—and that thereafter the expansion of our flotilla had to be more or less improvised, with scarcely any time for improvements which are usually the fruit of prolonged research, that their real achievements can be appreciated. It was necessary above all to add to their number and shorten the building period. For this reason, and because we counted on a speedy ending of the war, a considerable number of small boats were built. Owing to their restricted radius of action these little craft were selected for operations in coastal and British waters. This, however, happened to be the area where counter-submarine tactics were most potent, and the work of our boats was consequently rendered more difficult. It was only towards the end of the conflict that we obtained submersibles of 1200 to 2000 tons which were able to keep the sea for three months. Moreover, the surface speed was raised from 12 knots to 18, and the submerged speed from 7 knots to 9½. And now we have heard that the British had already built submarines with a surface speed of 24 knots. Science will undoubtedly find means of developing the submarine still further, with the object of enabling it to act not only as a commerce destroyer, but as a unit capable of taking part in a fleet action. We need only remember the advance which has been made in the speed of steam-driven surface ships over the early representatives of this type. It should be noted also that counter-operations will become less effective in proportion as the submarine develops more formidable powers of attack, higher speed, and greater handiness."

I may interpolate here some remarks made by Admiral Scheer on another occasion apropos the evolution of the submarine. He then recorded his firm conviction that a type will be reached which shall be able to remain at sea for at least eight months, to serve as a tactical unit of the battle fleet, and to be armed with guns sufficiently powerful to fight destroyers and even light cruisers. His belief is that these future submarines will be so large and so heavily armed that the necessity for rapid submergence will no longer exist. Submarines of this improved type will, he thinks, be auxiliaries of the utmost value to a battle fleet, though he does not concur with Admiral Sir Percy Scott that the submarine can wholly replace the battleship.

Admiral Scheer is averse to a further increase in the dimensions of capital ships, and he regards as Utopian the idea that battleships of a tonnage approximating to the present-day scale can ever be given the faculty of submergence. Nor does he consider it necessary. On the other hand,

it is easily possible, he contends, to enlarge the submarine cruiser to the point at which its habitability will be practically equal to that of big surface ships and its guns can be served with full effect—and this without nullifying its character as a submersible, whose primary weapon is the torpedo. Predicting in outline the effect of such development on naval strategy, he continues:

"As the submersible warship grows in power and efficiency the value of the surface ship will decline. The present conception of 'command of the sea' will lose its meaning. For a superior battle fleet is not suffcient in itself to defeat an adversary who is conducting a war on commerce with submersible cruisers. However strong the battle fleet may be, it cannot protect trade so long as the enemy's submarine strongholds remain undestroyed. During the late war Britain was not successful in this respect, despite her great superiority over the German fleet and her favorable geographical position *vis à vis* our bases in Flanders and the Heligoland Bight. Anti-submarine operations, to be really effective, must be carried right into the enemy's coastal waters, where the attacker is at a great disadvantage owing to the distance from his own base and the proximity of enemy submarine harbors.

"On the high seas the fast submersible cruiser will have little to fear from counter-tactics. It will render large oversea naval and military operations practically impossible, since no great fleet could traverse wide stretches of ocean and afford adequate protection to its communications when numerous enemy submarines of almost unlimited endurance and high speed were at large.

"In a fleet action the function of the fast submarine will be to understudy the destroyer and attack the enemy line. The fact that submarine attacks may be delivered at any moment without warning is bound to influence gunnery conditions and fleet tactics in general. Finally, great battle fleets are no longer able to fulfil their chief function, which is the protection of commerce. Every power which can defend its own coast will be able to take part in this submersible warfare, without being forced to fight an action for the command of the sea. Predominance in size and numbers of capital ships has ceased to imply strategical predominance in the naval sphere."—*The Naval and Military Record*, 13 July, 1921.

MISCELLANEOUS

THE SPERRY GYROSCOPIC STABILIZER.—In our issue of May 6 last we gave on pages 550 and 556 a description and illustrations of the gyro-wheels forming part of the installation of a Sperry gyroscopic stabilizer which was being built for installation in the American liner *Huron*, each of these wheels weighing finished 100,000 pounds. We now learn that an installation of this kind is to be fitted by the Admiralty to a flotilla leader, and that the equipment will be built in this country by the Metropolitan-Vickers Electrical Company, of Trafford Park, Manchester. The results of this installation will be regarded with much interest. We may add that the photographs of the large rotors which we reproduced on page 556 of our issue of May 6 were taken at the South Bethlehem Works of the Bethlehem Steel Company, Pennsylvania.—*Engineering*, 15 July, 1921.

ARE WE READY FOR WHOLESALE MURDER?—Are civilized nations at war prepared to adopt weapons that will enable them to wipe out an army of a million men in a few hours or to annihilate whole cities? Our chemical-warfare service assures us that the United States now possesses the means of doing this very thing. What are we going to do about it? The editor of *The Scientific American* (New York) expresses his belief that the world at large is not ready to go the Germans several points better in disregard of the humanitarian laws of war. All poison-gas warfare should be declared unlawful, he thinks, by international agreement of

some sort. Unless something of this kind is done, the next war, he believes, will make the last one "restful, by comparison," and will "wipe out mankind at a rate which will turn many a flourishing capital into a deserted village." The development of highly destructive weapons, he points out, has never yet prevented nations from making war, and if these horrors are to be averted either war itself must be made impossible, or the nations must get together on this point, if on no other. He writes:

"'Mr. Chairman, the Chemical-Warfare Service has discovered a liquid approximately three drops of which, when applied to any part of the skin, will cause a man's death. Much smaller amounts than this, or even vapors from the liquid, cause very severe, slow-healing burns.'

"If the reader applies to the Government Printing-Office, at Washington, he can get therefrom a copy of the 'Hearings at the Third Session of the House Naval Affairs Committee,' and he will find there that the words above quoted form part of a statement by Mr. Bradner, Chief of Research of the Chemical-Warfare Service. Mr. Bradner goes on to remind the committee that the world war showed it to be possible for an airplane to fly within a hundred feet of enemy troops and machine-gun them with impunity; and he goes on to state that if, instead of carrying machine guns, the attacking planes were equipped to carry a tank of this liquid (Lewisite) for discharge from nozzles similar to the ordinary street-sprinkler, it would fall like rain, killing everything in its path.

"Then he becomes more specific and tells us that one plane, carrying two tons of the liquid, could cover a stretch of country 100 feet wide by seven miles long in one trip, and that it could spray down enough of the liquid gas to kill every man in that area simply by the action of the gas upon the skin. Then, a little later, he becomes even more specific and tells us that, during the Argonne offensive, the entire First American Army of a million and a quarter men occupied an area of approximately 40 kilometers long and by 20 kilometers wide. If, he goes on to say, Germany had possessed 4000 tons of this material and, say, 350 planes properly equipped for spraying, our entire First Army would have been annihilated in from ten to twelve hours.

"Now, 4000 tons seems like a big lot of gas; but we already possess at the Aberdeen Proving Ground a huge poison-gas factory (Edgewood) which was capable, at the armistice, of producing 200 tons of gas per day, and it would be a simple matter by enlargement and duplication to put this country in a position where it could produce several thousand tons of gas for the supply of our armies and keep the supply going indefinitely. Yes, the future war will be so horrible as to make the late war restful by comparison. Short as it will inevitably be, it will last long enough to wipe out mankind at a rate which will turn many a flourishing capital into a deserted village, and many a fair campagna into a Sahara of lifeless desolation—for this gas, remember, is as fatal to vegetation as to human life.

"All this talk, however, about the poison-gas war of the future is based on what we dare to believe is an altogether unwarrantable assumption—namely, that the devil's own disregard of the humanitarian laws of war, initiated by the Germans at Ypres, is to be accepted and practised by the world at large. If, in the forthcoming meetings on disarmament, or of the suggested 'Association of Nations,' or the League, or what-not, it be accepted that poison-gas warfare is lawful, we dare to believe that this sanction will be given in the face of the protest of that undoubtedly large majority of men who believe that honor, chivalry, and human kindness are not quite dead in our midst, and that the monstrous horror of the first gas attack at Ypres should not be the yardstick by which we measure our future military conduct.

"It has been urged that the free use of gas will make future wars so frightful that no nation will dare to provoke a conflict. The answer to

that assumption is that, in the past, the development of new weapons of great destructive power has never prevented a nation from rushing into war."—*The Literary Digest*, 16 July, 1921.

CURRENT NAVAL AND PROFESSIONAL PAPERS

Internal Combustion Engines in Marine Service. *Journal of the Franklin Institute*, July, 1921.

Fuel Problems of the Future. *The Engineer*, 1 July, 1921.

Tomorrow's Airships. *Scientific American*, 30 July, 1921.

Motor Control Equipment—Protective Features. *Power*, 2 August, 1921.

Ships Propellers. Notes on results of experimental research regarding "cavitation" as affecting propulsive efficiency. *Engineering*, 8 July, 1921.

Description of a demonstration of Foamite Firefoam recently held at Camden, N. J., for the benefit of the Imperial Japanese Naval Commission.

NOTES ON INTERNATIONAL AFFAIRS

FROM JULY 10 TO AUGUST 10

PREPARED BY

PROFESSOR ALLAN WESTCOTT, U. S. Naval Academy

CONFERENCE ON DISARMAMENT AND FAR EAST

PRESIDENT HARDING PROPOSES CONFERENCE.—On July 10 the U. S. State Department issued the following announcement of negotiations undertaken for a conference on limitation of armament and the settlement of problems in the Pacific and Far East:

The President, in view of the far-reaching importance of the question of limitation of armament, has approached with informal but definite inquiries the group of powers heretofore known as the Principal Allied and Associated Powers, that is, Great Britain, France, Italy and Japan, to ascertain whether it would be agreeable to them to take part in a conference on this subject, to be held in Washington at a time to be mutually agreed upon. If the proposal is found to be acceptable, formal invitations for such a conference will be issued.

It is manifest that the question of limitation of armament has a close relation to Pacific and Far Eastern problems, and the President has suggested that the powers especially interested in these problems should undertake in connection with this conference the consideration of all matters bearing upon their solution with a view to reaching a common understanding with respect to principles and policies in the Far East. This has been communicated to the powers concerned, and China has also been invited to take part in the discussion relating to Far Eastern problems.

Favorable replies were at once received from France, Great Britain, Italy, and China, and later from Japan. In the Netherlands the feeling was expressed that in view of that nation's large possessions in the East Indies, she should also have been included among the nations invited, but the American Government felt the necessity of keeping the conference small enough to work effectively. After further inquiries, Armistice Day, Nov. 11, 1921, was suggested as a suitable date for opening the conference, and this date was accepted by the nations concerned. The Soviet Government issued a protest because of the failure to include the Siberian Republic, and declared that it would not be bound by any decisions reached by the conference.

JAPAN SEEKS TO LIMIT SCOPE.—To Japan the plan of a conference, not only upon disarmament, but upon Pacific questions as well, apparently came as a surprise. Her first reply was favorable as regarded disarmament, but requested information as to the scope and nature of subjects to

be discussed in connection with the Pacific and Far East. In reply, the American Government on July 23 suggested that Japan should not press for an immediate decision as to the subjects to be discussed, but should leave the precise agenda of the conference for later adjustment. Japan's final acceptance on July 27 was expressed as follows:

The Japanese Government have taken note of the contents of the American memorandum of July 23, received through the American Chargé d'Affaires, in reply to the Japanese memorandum of July 13, on the subject of a conference on the limitation of armaments to be held at Washington.

It has been brought to the knowledge of the Japanese Government that the Government of the United States is willing to proceed with exchanges of opinion regarding the agenda prior to the meeting of the conference and that it considers it advisable to adjust in that agenda the nature and scope of the Pacific and Far Eastern questions to be discussed at the proposed conference. The Japanese Government, on that understanding, are happy to be able to inform the American Government that it is their intention gladly to accept an invitation for a conference which shall embrace the discussion of the Pacific and Far Eastern questions.

The Japanese Government have been made aware through the communications and the published statement of the American Government and the conversations between the Secretary of State and Baron Shidehara that the propositions of the American Government to discuss the Pacific and Far Eastern problems is based on the close bearing they have on the question of the limitation of armaments, which is the original and principal aim of the conference, and that therefore the main object of discussing these problems is to reach a common understanding in regard to general principles and policies in the Pacific and the Far East. Desiring, as they do, to contribute to the establishment of an enduring peace and to the advancement of human welfare, the Japanese Government earnestly hope that the proposed conference may attain the expected results, and their ideals may therefore be brought nearer to realization.

In order to ensure the success of the conference, the Japanese Government deem it advisable that the agenda thereof should be arranged in accordance with the main object of the discussions as above defined, and that introduction therein of problems such as are of sole concern to certain particular powers or such matters that may be rewarded accomplished facts should be scrupulously avoided.

YAP CABLES TO UNITED STATES.—Washington, July 29.—Secretary Hughes has written a letter to President Harding on the subject of communications facilities in the Pacific, in which, in addition to dealing with the needs of that situation he asserts his belief that it is probable the cable from Guam to Yap will be allocated to the Government of the United States.

The Secretary is hopeful that there will be an early and mutually satisfactory settlement of the controversy that existed for some time over the disposition of the former German cables radiating from the Island of Yap.—*N. Y. Times*, 30 July 1921.

PRELIMINARY CONFERENCE ABANDONED.—Following Great Britain's acceptance of the conference invitation, the difficulty arose that the premiers of Australia and New Zealand, who were deeply concerned in the settlement of eastern questions, would be unable owing to the meeting of their parliaments to attend a conference held in the autumn of this year. Inquiries were therefore made as to the possibility of a smaller preliminary conference, but the United States did not view favorably the idea of two

separate meetings. The surmise was made that Japan desired the earlier smaller gathering in order that certain Pacific questions might be settled before the general meeting. The British version of these negotiations for an earlier conference was given as follows in a summary issued by the Imperial Conference of Premiers:

"In accordance with the suggestion which was believed to have been made by the United States Government that the conference on disarmament should be preceded by conversations or consultations between the powers principally concerned in the future of the Far East and the Pacific, the Imperial Conference, anxious that for the Anglo-Japanese agreement there should be substituted some larger arrangement between the three great powers concerned, namely, the United States, Japan and Great Britain, and holding the firm conviction that the later discussions on disarmament, to which they attached transcendent importance, could best be made effective by a previous mutual understanding on Pacific questions between these powers, discussed these preliminary conversations or consultations, which the United States Government had in principle agreed should be held in London.

"When it transpired that there was some misunderstanding as to the nature of the suggested preliminary conversations, the British Government, in a desire to remove any possible misconception and to meet what it believed to be the United States view, volunteered to attend a meeting on the other side of the Atlantic, at which the agenda of the Washington conference could be discussed.

"Premier Lloyd George, Marquis Curzon and the Dominion Premiers were prepared to attend such a meeting, if invited by the United States Government. Japan also had signified her willingness to attend. The United States Government, however, did not favor the idea, which accordingly was dropped.

"At no stage was it suggested that the result of such consultation should either anticipate the work or tie the hands of the Washington conference. On the other hand, the Imperial Conference made the proposal because it was anxious to remove every possible obstacle from the path of the Washington meeting, which it desired to see attended with complete success."

ANGLO-JAPANESE PACT CONTINUES INDEFINITELY.—It now appears that the Anglo-Japanese Treaty will continue indefinitely, until formally denounced by either power. Premier Lloyd George's statement in Parliament on July 11 summarizing the work of the Imperial Conference explained the situation thus:

"The object of our discussion was to find some means to limit the danger of heavy naval expenditure in the Pacific and remove those evils which tend to limit the development of our legitimate interests in the Far East. We had to ascertain our position in regard to the Anglo-Japanese agreement in view of the decision of the League of Nations. We had to consider the position of the agreement. There was some doubt as to whether the agreement had lapsed.

"The question was referred to the Lord Chancellor, and he, with the law officers of the Crown, came to the conclusion that the agreement remained in existence for one year after it had been formally denounced. It follows, therefore, that the Anglo-Japanese alliance remains in force until it is denounced, and will only lapse at the expiration of twelve months after notice of denunciation has been given.

"It is the desire of the British Empire and of Japan that the agreement should be brought into complete harmony with the Covenant of the League

of Nations, and where the one is inconsistent with the other the terms of the Covenant shall prevail. Notice to this effect has now been given to the League."

MEETING OF SUPREME COUNCIL

ALLIES DIVIDED OVER SILESIA.—During the latter part of July serious differences of policy developed between Great Britain and France regarding the settlement of the Silesian question. On July 20 the British Government proposed an immediate meeting of the Supreme Council. The French Government objected to a conference at that time, stated that it intended to send more troops to Silesia, and suggested that Great Britain do the same. The idea of independent action on the part of France was sharply opposed by Great Britain.

London, July 28.—A situation of serious difficulty in the relations between Great Britain and France has arisen out of the discussions regarding Upper Silesia. The French Government has addressed to London a note in which the British position is described as an "unfriendly attitude" and a reply has been drafted in which it is stated that persistence in the French policy may provoke a rupture of the Entente between the two countries which contributed to the allied victory in the war.

Reception of the French note created consternation in British diplomatic circles. Conversations which had been carried on between the Foreign Office here and the Quai d'Orsay had not conveyed any suggestion that the different points of view in regard to Upper Silesia could not be brought into harmony by frank discussion. Britain wanted an early meeting of the Supreme Council. France held that before the Supreme Council made its decision on Upper Silesian partition questions, allied troops should be reinforced so as to preclude the possibility of that decision being disputed by the local populations or, as the French plainly suggested, by German volunteer forces.

The British idea was that trouble, if there was trouble, would be more likely to arise from Polish dissatisfaction with the decisions of the Supreme Council, but on the whole it was held here to be improbable that there would be any serious opposition. Free and frank discussion of the problem was, it was thought, calculated to clear the air.

The French note received this morning put a different complexion on the affair. It was couched in language which London has not been accustomed to hear from Paris.

A Cabinet Council was summoned. The Dominion Premiers were invited to attend, seeing that their countries had valorously responded to the call which went forth to the world when German militarism menaced the continent of Europe. The Dominion Premiers were of one mind with regard to the present situation, where a new militarism threatens the continent. The British Empire will not march with France if it is a question of creating in Europe a new régime of force.

COUNCIL MEETING ON AUGUST 8.—The difficulties of the Allies were finally settled by agreement upon a meeting of Supreme Council on August 8. France in the meantime promised not to send reinforcements to Silesia without the consent of the Allies, and Germany, in response to an Allied note of Aug. 3, agreed to permit the transport of troops across Germany upon the joint request of the three Allied European powers.

GERMANY

LIGHT PENALTIES AT LEIPSIC TRIALS.—Following the protest and withdrawal of French representatives early in July, the Leipsic Court continued the trial of war criminals accused by Great Britain and Belgium. The Belgian Government expressed great dissatisfaction at what was regarded as the complete travesty of justice in the proceedings. In the British press the view was expressed that, considering the unprecedented character of the trials, the light penalties were not to be regarded as wholly inadequate or without moral effect.

PEACE NEGOTIATIONS WITH UNITED STATES.—It was announced in Washington on July 19 that the American Commissioner in Berlin had been requested to make inquiries of the German Government as to a suitable method of reopening diplomatic and commercial relations. A proclamation of peace by President Harding, according to press reports, was regarded as an appropriate first step. Such a proclamation, it was thought, would have no effect in restoring German property seized in America, at least not without further action by Congress.

GREAT BRITAIN AND IRELAND

IRELAND CONSIDERS BRITISH TERMS.—In accordance with previous arrangement, Mr. Lloyd George and Mr. Eamon de Valera met in London on July 14, to discuss possible terms for a settlement of the Irish question. Later conferences were attended also by Premier Craig of Ulster, who left London, however, on July 18, stating that Ulster would insist upon a status separate from southern Ireland.

Mr. de Valera on July 21 was given a brief written statement, said to contain not more than nine or ten heads, setting forth the definite proposals of the British Government. It was understood that these offered substantially self government for Ireland similar to that of Canada and South Africa, with only reservations of a naval and military character due to the closeness of Ireland to the center of the Empire. Upon his return to Ireland Mr. de Valera submitted these terms to Sinn Fein leaders, by whom in subsequent weeks they were given close scrutiny. British papers stated on Aug. 2 that the terms would probably be acted upon by a full meeting of the Dail Eirann, or Irish National Assembly, for which purpose the 36 members of that body in prison would be released. Upon his return to South Africa, General Smuts wrote to Mr. de Valera strongly approving the British offer and urging its acceptance:

> The *Daily Chronicle* commenting this morning (July 23) on the report that the British offer of dominion home rule to Ireland reserves control of the army, navy and air force in Ireland, says the reservation "corresponds to geograhpical necessity which renders it necessary for the strategic defense of the British isles to be planned, controlled and maintained as a whole. We have difficulty in believing that it should offer any stumbling block to intelligent Sinn Feiners who except from directly anti-British motive could have no ground to prefer a petty Irish army and navy under separate control."

The outstanding crux of the problem, *The Chronicle* goes on, seems still to be in the relations of southern Ireland and northern.

"If southern Ireland," it says, "gives up the idea of controlling northern Ireland by force to enter a single Irish polity there can be peace tomorrow on the broadest basis of liberty for South and North alike and with the fairest hopes of their eventual voluntary reunion. If on the other hand counsels of force prevailed, not only would the immediate hope of peace vanish, but ultimate mutual reconciliation of North and South would be pushed away into far remoter future."

BRITISH NOTE ON OIL RESTRICTIONS.—A final British memorandum on the control of oil in all British dominions was sent to the United States Government on April 21 and published on July 5 in a British White Paper. The memorandum states that Great Britain is second only to the United States and (in normal times) Russia in oil consumption, 90% of her navy being at present oil fired, her imports of oil in 1920 amounting to 3,368,000 tons, of which 68% came from the United States and a total of 98% from foreign countries. In Canada and Trinidad oil concessions are restricted to national companies, and the same is true in Egypt, but elsewhere throughout the British Empire, according to the memorandum, there are no handicaps on foreign concerns. Of the Mesopotamian and Palestine mandatories, it is said that "while there was no intention of discriminating against non-British interests, account must be taken of legitimate rights acquired by British companies before the war." The memorandum points out that the United States is taking a chief share in the development of Mexican oil fields and is sure to play a leading part in the opening up of Central and South American fields.

RUSSIA

SOVIET WILL DISREGARD CONFERENCE ACTION.—Riga, Latvia, July 22 (Associated Press).—Soviet Russia's note of protest against the failure to extend her an invitation to the Washington conference on Far Eastern questions, handed to the American Chargé at Stockholm yesterday, declares that the Moscow Government will not recognize any decisions reached at a conference at which it is not represented.

The note, which was signed by M. Tchitcherin, the Soviet Commissary for Foreign Affairs, protests also against the lack of an invitation for the Far Eastern Republic. The Soviet Government reserves complete freedom of action, it declares.

The Soviet note was sent not only to the United States, but also to Great Britain, France, China and Japan.

RELIEF CONDITIONED ON RELEASE OF PRISONERS.—In response to the appeal of Maxim Gorky of the Russian famine relief committee, Herbert Hoover as head of the American Relief Association sent a note on July 25 declaring that American relief in Russia would be granted only upon the release of all American prisoners and the fulfillment of other conditions. For the purpose of securing a written agreement to this effect from the Soviet authorities, Mr. W. L. Brown, the European Director of American Relief, started for Riga on July 31. It was calculated that the American relief body could care for 1,000,000 starving children and invalids.

A demand for the release of American prisoners was also made by Secretary of State Hughes through the American Consul at Reval, as follows:

"The American Government is advised that, despite the repeated efforts of Dr. Nansen on its behalf to secure the release of the American prisoners in Russia, they are still held in a most serious plight.

"In the name of humanity the American Government demands of the Soviet authorities that these prisoners be at once released. It is manifestly impossible for the American authorities to countenance measures for relief of the distress in Russia while our citizens are detained."

PRISONERS RELEASED.—The Soviet Government issued several statements to the effect that it had made no appeal for aid. On August 6, however, it was confirmed that the 7 or 8 American prisoners held at Moscow had been released and would at once be sent across the border.

RUSSIAN FAMINE CONDITIONS.—A statement issued by the U. S. Department of Commerce on Aug. 1 declared that the famine in Russia was most acute in the Volga valley north of the Caspian Sea, but that production in various parts of Russia had been cut down 50% or more. The total grain production for Soviet Russia in 1921 will be 4,320,000 bushels, as against 7,614,000 in 1920, and the potato and oil seeds crops are cut in half. In northern Russia the shortage of food is chiefly due to the general decadence of agriculture and the breakdown of transportation from the south and east. "Industry in general has decreased over 90 per cent."

ITALY

PROPOSED PAPAL STATE.—Rome, July 17.—On the eve of the reopening of of the Chamber when the Cabinet will present its program to Parliament the possibility of settling the vexed Roman question seems even nearer than with the former Cabinet. In the new Administration the Catholic Party has great influence, there being three Ministers and several Under Secretaries of State belonging to that party. One of the most important portfolios is entrusted to a member of the Catholic Party, the Ministry of Justice, which deals with all relations between Church and State and has under its jurisdiction all ecclesiastic affairs.

Many say that question might be solved according to the plan suggested by Cardinal Bourne, according to which the Pope would receive a tract of land on which he would have all rights and prerogatives of a king. The Cardinal stated that many lords and land owners in England possess large estates where they practically reign supreme. Why should not the Pope be treated in like manner?—*N. Y. Times*, 17 July, 1921.

BALKANS AND NEAR EAST

BALKAN ALLIANCE AGAINST GREECE.—Paris, July 10.—A sudden change in the Near Eastern kaleidoscope has switched the center of interest from Asia Minor to Thrace. The cause of the trouble is a Turko-Bulgarian plot to evict the Greeks from the territory north of Constantinople allotted to them by the Treaty of Sèvres.

It is learned from a trustworthy source that it is anxiety about this region, far more than fear of a Turkish advance upon Constantinople from Ismid, that motived the British naval concentration at the Turkish capital and the troop movements reported from Malta. Assurances of

Bulgarian support also are said to be the reason Mustapha Kemal suddenly imposed impossible conditions for a meeting with British representatives which he himself had requested a few days before.

It is a matter of common knowledge in the Near East that both the Turks and Bulgars are bitterly dissatisfied by the attribution of Thrace to the Greeks. The former claim that it puts their capital at the mercy of a hostile advance and the latter that it imposes an intolerable hardship by cutting them off completely from the sea. Accordingly, both parties have been intriguing most busily the last weeks. The quarter in which their activities have been directed has been Serbia, which not only possesses the best fighting force in the Balkans, but is inspired by keen personal hostility to King Constantine and the schemes he is believed to entertain to dominate Constantinople.

Between the Serbs and Bulgars Macedonia has always been a bone of contention, but months ago the Bulgarian Foreign Minister, Dimitrioff, paid a visit to the Serbian capital to propose a solution of the problem. The plan suggested was that Macedonia should become an independent State whose port-way capital should be Saloniki. Nor was this all. Serbia and Bulgaria, both of whose nationals bulk large in the Macedonian population, should form a sort of triple confederation with the new State—perhaps actually a federation under one central government. In either event there was to be no tariff barriers between the three neighbors, and thus Bulgaria would obtain the free access to the sea which she so ardently desires.

Evidently this plan, which is reported to have found high favor in Serbian eyes, could only be carried out at the expense of the Greeks. It was therefore found desirable to enlist the support of the Turks by offering them Adrianople and Eastern Thrace.—*N. Y. Times,* 10 July, 1921.

SUCCESSFUL GREEK OFFENSIVE AGAINST TURKS.—The Greek offensive against Turkish Nationals in Asia Minor, which was started in the middle of July, resulted in a general pushing back of the Turkish forces. It was reported on July 26, but apparently without foundation, that Mustapha Kemal had made peace overtures through the Allies. The Turkish losses at that date were said to amount to about 60,000 killed, wounded, and prisoners.

LATIN AMERICA

PANAMA APPEALS TO ARGENTINA.—Following Panama's appeal to Argentina and other South American states in the matter of her boundary dispute with Costa Rica, the U. S. Government on July 18 addressed a memorandum to Argentina setting forth its reasons for considering the White award binding, and the duty of the United States to see that Panama fufilled her international obligations. Panama in a note to the United States made public on July 25 urged that her dispute be referred to the Hague Tribunal.

MEXICO INVITES CLAIMS DELELGATES.—Mexico City, July 13 (Associated Press).—All countries whose nationals have suffered damages from Mexican revolutions have been invited by President Obregon to appoint delegates who will meet Mexican representatives and form a permanent commission to pass upon claims. The invitation was issued in the form of a Presidential decree promulgated last night, and it will be sent to all interested nations by the Foreign Office.

President Obregon's decree is regarded in official circles here as a most important step in the President's reconstruction program and as indicating

a sincere desire on the part of the Government to set Mexico's house in order.

The Mexican Claims Commission has made no recent announcement of the amount of the claims filed with it, but late last year the total was given as more than 32,000,000 pesos, of which more than 20,000,000 pesos represented claims for foreigners.

Tampico, July 13 (Associated Press).—Resumption of operations in the Tampico district by oil companies is expected in official circles here. Drilling permits are being granted daily by the Government, and some companies have continued work during the past troublesome month without discharging a single man. It was declared yesterday by a Government official that the situation here was not a local problem, but was the outcome of world conditions. He said that the new taxes placed on petroleum exports had but secondary influence on operations in this district.

General Arnulfo R. Gomez, commander of the Mexican military forces in the oil region, expressed regret yesterday that the United States cruisers *Sacramento* and *Cleveland* sailed from Tampico, as he had planned to entertain the officers of the warships, with whom he had a cordial meeting.

The General further stated he was fully prepared to protect the lives and interests of North Americans, as well as those of any other nationals.

REVIEW OF BOOKS

"The Plattsburg Movement: A Chapter of America's Participation in the World War." By Ralph Barton Perry. pp. X, 275. Price $2.50. (New York: E. P. Dutton & Co.)

"The book," says the author, "is primarily an account of one of the aspects of America's preparation for war." As most people know, while the National Government in 1915 and 1916 was still holding—as many believed, fatuously—to the idea that America could keep out of war, those interested in the Plattsburg camps, led by General Wood, were doing their best to prepare for what they believed was inevitable. And as some people also know, there was a close relationship between the Plattsburg camps and the Officers' Training Camps which came into existence upon America's entrance into the war. But few, it is safe to say, are aware that out of 20,000 men who attended the Plattsburg camps 1913-1916, no less than 18,000 when the crisis came entered the Army or Navy, nearly all as officers; and still fewer know that it was the Military Training Camps Association, comprising the men who had been interested in and attended the camps previous to 1917, that rushed to the support of the Army staff officers and others upon whom devolved the organization and recruitment of the Officers' Training Camps, 1917. Haste was imperative, yet the General Staff had no detailed plans in readiness, and it was without the personnel required for organizing the camps. The Military Training Camps Association was busy everywhere. Its most effective co-operation was in the East, and yet what it did in the Central Department is shown by the following:

"When the camps were announced the Department Commander, General Thomas H. Barry, found himself without funds and without the necessary recruitment personnel. He telegraphed to Washington without result. Thereupon the Training Camps Association obtained from business offices in Chicago seventy clerks and stenographers, with the necessary desks and typewriters. Within eighteen days over 75,000 applications were received in the various headquarters of this Department alone."

When the second series of Officers' Training Camps was ordered in June, 1917, the War Department turned over to this civilian organization, the Military Training Camps Association, the entire charge of the printing and distribution of 250,000 copies of the circular of announcement and application blank. It is not strange that those attending the first and second Officers' Training Camps voted unanimously to join the Military Training Camps Association. The work of the Training Camps Association soon became national, and local committees were organized through the efforts of Departmental and Divisional headquarters in 1300

cities, and nearly 900 of these were engaged in active work on the date of the Armistice.

As a complete record of the work of the Military Training Camps Associaion Professor Perry's book leaves nothing to be desired. The author gives with careful detail the numbers attending each camp, the official letters, the resolutions, and the legislation attempted and secured.

Yet the book brought to the writer of this review, who attended the Plattsburg camp of September, 1916, a feeling of disappointment. The Plattsburg Movement was more than figures, letters, resolutions, and statutes. It was chiefly men, who though keenly alive in their own profession or business, were as awkward as the greenest West Point or Annapolis plebe when thrown into a military organization. No one realized this more than they did. In moments of relaxation they bubbled over with merriment on recalling their blunders. Yet they realized that if war should come it was out of such material that officers must be made. And they surprised the regular officers in charge of their instruction by the terrific earnestness with which they threw themselves into their new life, going it hard all day long and not infrequently volunteering for drills in the evening and on Sundays. Of this the book says next to nothing.

The book fails because it gives the statistics but not the spirit of Plattsburg. It gives the history of the Military Training Camps Association, but not of the Plattsburg Movement in a large sense, to quote the sub-title, as "A Chapter of America's Participation in the World War." Thus it frequently makes mention of Mr. Grenville Clark, President of the Association, and Mr. Arthur F. Cosby, Executive Secretary, as well as other officers. But what of the men who attended the first series of Officers' Training Camps, two of whom were commissioned colonels, 235 majors, 3,722 captains, etc.? Who of this number distinguished themselves in action and received merited decorations? There is assuredly no test of a splendid organization, like that born at Plattsburg, equal to that of actual service in the field and at the front. Yet not a single career, nor a single name is here given. And the inspiration that comes from a simple record of those who proved themselves ready to give their all, and of some who made the supreme sacrifice is absolutely lacking.

C. S. A.

"Sea Power in the Pacific." By Hector Bywater. Price $5.00. (New York: Houghton, Mifflin Co.)

(Editor's Note:—It must be remembered that the opinions and remarks contained here are not those of the reviewer. His effort has been simply to reduce a volume of some three hundred pages to a form in which its essential points may be easily grasped, and he has endeavored throughout to reproduce the ideas and opinions of the author, Mr. Bywater.)

This, the most important recent estimate of the situation in world politics which concern the Pacific, an excellently detailed account of the naval power and the capacity for carrying on war of Japan and the

United States, has just come from the press of the Constable Company in London. The author is a very prominent writer on naval and international subjects in England, an associate of the Institute of Naval Architects and will need no introduction to those familiar with his frequent articles in *The Naval and Military Record* and *The Engineer*. His regular contributions to these papers are noted for their detailed accuracy and his estimates and figures in the present volume may be expected to be of the most dependable sort. The book is remarkable for the extent to which the author has investigated the data for his conclusions and the accuracy he has attained in his search. Probably no time could be more opportune for its arrival than that immediately preceding the disarmament conference, which has every likelihood of becoming a world event of the first importance.

In the opening chapter the author calls attention to the complete alteration in the political and military outlook which has occurred since the German fleet surrendered at Scapa Flow. The world in general, and Great Britain in particular, has become used to regarding the North Sea as the center of gravity of international consideration and the necessity now exists of schooling those unacquainted with the rapid alteration of international affairs to the view that the center of interest has become definitely lodged in the Pacific, and that all other questions of an international nature are distinctly subordinate to those which may lead to trouble in the Far East. The elimination of all actual competition in Europe has left Great Britain in a position to organize her naval policy on lines that are of Imperial instead of local importance, and in the author's discussion of this relief from European competition at sea, it is astonishing to find that so short a time ago as 1900 the French were the possessors of the Navy against which the English most guarded. That is but 21 years ago, and since then the Russian fleet has come up and gone down, the German fleet rose to be the second of importance in the world and now ceases to exist, and the French fleet has sunk, both relatively and actually, to an inferior position.

Previous to the war, a fever of battleship building swept over Europe. It began with Germany's bid for sea power. As she continued to enlarge her navy, so Great Britain took extra strides to remain comfortably ahead of her. Under the promptings of the Germans the Austro-Hungarians took in hand the construction of heavy men-of-war and the Italians followed suit, having in mind the possible opposition of the Austrians and also, as one of their premiers expressed it, the intention of making Italy a most desirable ally in case one were required. Alarmed by the Italian expansion and not unaware of the threat which the German navy made to her channel ports, the French also joined the race and even Russia, in 1908 and 1909, surprised the world by the extent of the naval program to which she gave her attention. Likewise, Turkey and Greece and the smaller nations took to building ships, until the period between 1900 and the outbreak of the Great War saw what was undoubtedly the greatest era of warship building in the history of the world.

Now the reasons for the maintenance of large European fleets have ceased to exist. Austria is no longer a power; the German strength on the sea has been reduced to impotence; the Turkish naval force was surrendered at the conclusion of her participation in the war and France, prevented by reasons of economy from maintaining herself among the first navies of the world, has adopted a program apparently aimed at assuring her naval superiority in the Mediterranean. Were Great Britain forced to consider only her home islands, she could reduce her navy even farther than she has already done, but the Imperial Conference in London has made evident to the public what was long ago very plain to diplomats and military people, which is, that she must be prepared for active defense of any of her dominions and possessions. This means that questions which concern Canada and Australia and New Zealand and Hongkong and Singapore are matters of the first importance to her, and are demanding reasons for the maintenance of her force on the water. It has become an axiom of British statesmanship that the defense of the Empire means the defense of the lines of communication, and she may be depended upon to go to any means to insure these being kept in her hands.

In the first chapter the author goes into a comparison of the British and American navies as they will exist in 1924, or when our building program is completed. He compares the *Royal Sovereign*, as the best type of British ship in their possession at present, with our new *Indiana*, and with the following results: *Royal Sovereign* displaces 25,750 tons, being thus somewhat smaller than our *Nevada* class. She has a speed of 22 to 23 knots and carries eight 15-inch guns, fourteen 6's and four torpedo tubes. Her thickest armor, 13 inches, is over the water-line and the main gun positions. Her full broadside amounts to 15,360 pounds. Our new *Indiana* is to displace 43,200 tons, her designed speed is 23 knots. She is to carry twelve 16-inch and sixteen 6-inch guns and will have two torpedo tubes. Her maximum armor will be 16 inches and her broadside weight 25,200 pounds. From any viewpoint the supremacy of the *Indiana* is overwhelming.

The *Hood* is also compared to our *Lexington* class of battle cruiser, to her disparagement. The British ship displaces 41,200 tons with a speed of 31 knots and an armor of eight 15-inch and twelve 5.5-inch guns. Her broadside weight is 15,360 pounds. The *Lexington* is to displace 43,500 tons with the designed speed of 33 knots and an armament of eight 16-inch and sixteen 6-inch guns, with a broadside weight of 16,800 pounds. Mr. Bywater calls further attention to the fact that the disparagement is more than appears from the figures, due to the superiority in effect of the 16-inch 50-caliber gun over the 15-inch British gun of 42 or 45 calibers.

The relative condition of the navies of Great Britain and the United States in 1924 (providing the former does not construct any more battleships, but will turn out 4 battle cruisers of the *Hood* design, and providing also that the United States completes her 1916 building program), is detailed at length, but with an apology to the author, I will regroup the ships here in the characteristics which the United States Navy has des-

ignated for vessels of the first class. In 1924 this condition will be as follows:

	Great Britain	United States	Japan
Battleships, 1st line	*23	†21	†12
Battle cruisers, 1st line	*10	†6	†12
Light cruisers, 1st line	45	10	19

* 13.5-inch guns or better. † 14-inch guns or better.

GROWTH OF THE JAPANESE NAVY

The increase of naval expenditure in Japan since the Russo-Japanese War is shown to have been very rapid. The appropriations for 1906 were three times their amount in 1905 and thereafter the curve of expenditure mounted steadily. "Due to the peculiar budget methods practiced in Japan it is extremely difficult to total the various appropriations for naval service," but in 1918 the total was estimated at $125,000,000, a 30 per cent increase over the previous year.

In 1920 a sum of $250,000,000 was asked for the navy. In the discussion in the *Diet* in July 1920 concerning the new program, the Minister of Marine informed the members that the building list for which he was preparing involved 4 battleships, 4 battle cruisers, and 12 cruisers and smaller craft, for which the cost would be $340,000,000, which expense, however, was to be spread over several years. No other nation to-day is spending any such proportion of her income upon national defence as are the Japanese. They are aiming at the creation of what they have long called their "8:8:8 Fleet" and that means 8 battleships and 8 battle cruisers of the largest and strongest type, none of which are more than 8 years old, and it is apparent that this will be a most homogeneous and powerful force of vessels, able to overmatch another force superior to it in numbers, but inferior in the fact that its units are less uniform in power, design and age.

Before the American Pacific Fleet was created the Japanese were in undisputed superiority in the Pacific. Following the Anglo-Japanese agreement, the British withdrew their heavy fleet from Chinese waters and took it to the North Sea where it was needed to protect them against the Germans. Recently a very modern and effective British Fleet has made its appearance in the Far East, headed by the *Hawkins*, a large, fast, armored cruiser, completed in 1919 and carrying seven 7-inch guns. She leads a force composed of 4 light cruisers, each of 5000 tons displacement, and a submarine flotilla of 12 British "L" boats. All of these vessels are of the latest and most effective classes. There is also a force of 5 mine-sweeping sloops and the usual equipment of gunboats in the Chinese rivers. The Americans are represented in the East by a squadron distinctly inferior to those of the Japanese and the British, and Mr. Bywater assumes that the first step in any trouble between the Japanese and the Americans will be the complete destruction of our vessels there, who have neither the armament to stand and fight, nor the speed with which to run away.

DOMINION FORCES

The recent discussions in London during the Imperial Conference made it evident that the British scheme of naval defense considers the formation of local squadrons by each of the dominions, these forces to have sufficient strength to guard their own harbors and to take care of sudden forays upon their local lines of communication. The heavy British Fleet is to move into whatever quarter of the world it is required for the defense of The Empire. In this regard, the Australians have a force composed of the battle cruiser *Australia*, 5 light cruisers, a destroyer leader, 11 destroyers and 6 large modern submarines of the British "J" type. New Zealand maintains only one light cruiser in operation: the *Chatham*. The invitation to maintain the battle cruiser *New Zealand* in her home waters was declined on the ground of national economy. Canada, farther north, keeps in commission the light cruiser *Aurora*, 2 destroyers and 4 small submarines of a strength about equal to our "K" boats. In this connection Lord Jellicoe, after his tour of the British Dominions with a view of analyzing the naval situation, submitted a scheme for the maintenance of a Far Eastern Fleet, to be composed of the vessels of the Royal Navy, the East Indian Squadron and the Australian, New Zealand and Canadian forces. He recommended that its strength should be 8 modern battleships, 8 battle cruisers, 10 light cruisers, 40 destroyers, and 36 submarines, whose total cost of maintenance per year was projected at $100,000,000, of which sum the dominions would be expected to contribute three-fifths.

THE GROWTH OF ILL FEELING IN THE PACIFIC

In chapter two there is taken up in detail the whole matter of the friction between the Japanese and the people of the United States. Previous to the Spanish-American War the relations between Japan and America were of the warmest, but with our acquisition of the Philippines and Guam and Hawaii, there arose a distinct antagonism from the Island Empire. Various subsequent questions, mainly those dealing with China and immigration, have combined to supply material for trouble makers on both sides of the Pacific. The idea of territorial propinquity which may have brought out the Japanese protest concerning the Philippines could hardly be expected to operate in the case of Hawaii, which is 4400 miles away from Japan, and her protest over America's occupation of that group of islands led many observers to conjecture that she planned for herself the supreme dominion of the Pacific and viewed with alarm the passing of any of the islands into the possession of another country.

The immigration question in California is treated in full, but this matter has been so thoroughly done for the American public that it is not thought necessary to review the affair here, except to point out that one of the main objections to the presence of the Japanese is the fact that their low wage standard deprives American workmen of employment and that our Government will have the distinct backing of the American labor forces in any opposition they may raise to continued Japanese immigration or to

the maintenance of the Japanese workmen which are at present in this country.

Probably less well known to the American public however, are the discriminatory actions which the Japanese practice against foreigners in their own country, the same ones in a great many cases to which they object when operated on their own nationals abroad. For example, Japan does not allow foreigners, as individuals, to acquire landed property in the islands; they cannot become owners of ships flying the Japanese flag and such interest as they may attain in ship concerns is subordinate by law to Japanese control. Foreigners may not hold stock in national, agricultural or industrial banks, nor engage in mining operations, nor become members, shareholders, nor brokers of the exchanges, nor members of the Chambers of Commerce. They may not hold public office of any kind nor become members of the Japanese bar. Foreigners are not permitted to enjoy the franchise in Japan; they cannot engage in agriculture; foreign physicians and surgeons cannot practice in the country unless they have passed an examination in the Japanese language, both written and oral, before a board composed of native doctors. Under Japanese laws rebates may be granted by Japanese steamship companies on all goods belonging to Japanese merchants, by means of which they are enabled to undersell foreign competition, and Mr. Bywater states that it is recorded that the cases of litigation between foreigners and natives heard before Japanese courts have always shown an overwhelming proportion of judgments in favor of the Japanese. Regarding the questions of immigration, the Japanese maintain against the Koreans and Chinese precisely the same wall which the Californians wish to erect against them, and for exactly the same reasons. Chinese laborers are debarred from Japan on the grounds that they have a lower standard of living and that their participation in labor with the Japanese workmen will introduce unfair competition, and Korean workmen are permitted in Japan only under conditions which will protect the Japanese workman.

THE OPEN DOOR

The growth of this policy is very distinctly traced. In 1900 Russia took advantage of the Boxer Insurrection to move her troops into Manchuria and upon the termination of that trouble she neglected to leave. From that time on the Japanese prepared to bring the matter to the decisive point which they foresaw would have to be met, and this eventuated in the war of 1904 and 1905, from which they emerged a brilliant victor. The items of the peace treaty pledged both parties to leave Manchuria except in the case of the Liao-Tung Peninsula, where Japan succeeded to the rights which were formerly in the possession of Russia. Otherwise the administration of Manchuria was to go back into Chinese hands. It appears, however, that Manchuria simply changed one owner for another, for in succeeding years the Japanese secured from the weak Chinese Government concession after concession, allowing them to extend their railways throughout Manchuria with the result that the whole district came under their control. Foreign trade was admitted only upon conditions

which would not injure the sale of Japanese wares and this Japan was able to do because she controlled the sole means for distribution in the province. With an eye to preventing possible competition, Japan concluded with China an agreement whereby the latter renounced the right to build any railway in the regions transversed by the South Manchurian line (Japanese) or of granting concessions to anyone else to build other railways in the district served by the Japanese lines.

The author states that no positive action was taken in the matter of the gradual spread of Japanese supervision until 1908, when the American Government proposed "to guarantee to China the integrity of her Manchurian province by neutralizing the South Manchurian railway." It was proposed to lend China a hundred million dollars with which to repurchase the railway. This money was to be raised by a loan, jointly subscribed to by various powers, and not by the United States alone. The Japanese objected to this suggestion with such warmth that an alternative scheme was suggested, providing for the construction of a line to parallel the South Manchurian Railway and to destroy its monopoly in transportation. Mr. Bywater remarks that the only reason that an international crisis did not develop at this time was that the English bankers, who were to participate with the American bankers in backing the loan to China, withdrew from the agreement.

THE TWENTY-ONE DEMANDS

In 1915, when the world was concerned with the Great War, Japan suddenly presented to China her famous 21 demands. These related to Shantung, the Yangtse Valley, Fuhkien Province (on the mainland opposite Formosa), South Manchuria, and Eastern Inner Mongolia. Some of the 21 demands were communicated to the other nations of the world, but the most serious of them were concealed and China was warned not to make them public. They did become public, however, and were of a nature so broad and imbued with such an assumption of supervision on the part of the Japanese that they were received everywhere with distinct opposition and the great powers moved to secure their withdrawal. The secret articles of the Chinese Note were as follows:

"(1) The Chinese Government shall employ influential Japanese advisers in political, financial, and military affairs.

"(2) Japanese hospitals, churches, and schools in the interior of China shall be granted the right of owning land.

"(3) Inasmuch as the Japanese Government and the Chinese Government have had many cases of dispute between Japanese and Chinese police, the settlement of which caused no little misunderstanding, it is for this reason necessary that the police departments of important places in China shall be jointly administered by Japanese and Chinese, or that the police departments of such places shall employ numerous Japanese, so that they may at the same time help to make plans for the improvement of the Chinese police service.

"(4) China shall purchase from Japan a fixed amount of munitions of war (say 50 per cent, or more) of what is needed by the Chinese Govern-

ment, or there shall be established in China a Sino-Japanese jointly operated arsenal. Japanese technical experts are to be employed and Japanese material is to be purchased.

"(5) China agrees to grant Japan the right of constructing a railway connecting Wuchang with Kiukiang and Nanchang, another line between Nanchang and Hanchow, and a third between Nanchang and Chaochou.

"(6) If China needs foreign capital to work mines, build railways, and construct harborworks (including dockyards) in the province of Fuhkien, Japan shall be first consulted.

"(7) China agrees that Japanese subjects shall have the right of missionary propaganda in China."

In 1918 Japan induced China to enter into an agreement for common military and naval defense. It provided for their military co-operation, standardization of their war plans, their transport systems, their communications and military codes. It was written into the proposal that the agreements and stipulations contained in it should not be published either in Japan or China, but should be treated as a naval secret. This agreement was to terminate upon the conclusion of peace between the Allies and Germany, but in the autumn of 1920 the Peking Government is reported to have requested the Japanese to remove the troops in China which they had installed there under the pretext of the articles of the agreement. The author draws the conclusion that the action of Japan in China during the last twenty years leads to but one interpretation and that is that she is determined to secure all of the great native wealth of that empire to herself and to prevent the competition of any other nation if this can possibly be accomplished.

The efforts of the Chinese Consortium—a group of British, French, and American bankers—to induce the Japanese bankers to participate in the loan to China under a policy of mutual rights as distinct from that of individual monopolies, were met originally by great opposition on the part of the Japanese, who claimed that it was their right to develop the railways in Manchuria alone, and to refuse interest to any other power concerning their supervision. However, the efforts to come to a mutual understanding among the bankers are said to have met with distinct success and the British and American members have come home to compliment the Japanese upon their willingness to agree with them. Mr. Bywater has his own opinion concerning this, however, and expresses it as follows: "Exactly how far this scheme of joint financial control over the economic development of China will extend is not yet clear; but that Japan seriously intends to concede the principle of the equality of international interests in that country is difficult to believe in view of her past record. Such a concession would be absolutely opposed to the policy she has consistently followed since 1905, and it is possible that international finance takes too sanguine a view of the future."

THE POWER BEHIND THE THRONE

In describing the background against which the foreign policy of Japan is based, the author calls attention to the composition of the Japanese

electorate and of the Government. Japan has the outward appearance of a constitutional state whose institutions are modeled upon those with which we are familiar. As a matter of fact, it is remarked that the people have no real voice in other than purely domestic affairs and that in the Diet, which consists of an upper and a lower house, there is very little actual executive authority, and like the old German Reichstag, it comes closer to being a debating society than the principal feature of the executive branch. In the last forty years the Diet has been dissolved by the Emperor eight times for resisting and disagreeing with the government program. The real power is said to center in the *Genro,* or Elder Statesmen, whose number is given as five. It is generally assumed that all the outstanding features of Japanese policy are developed by this small body of powerful men and they are credited with the Japanese seizure of the Korean court and government in Seoul in 1894, of which action the Chinese War was the direct result.

The strength of the Japanese in the past has been that one which has stabilized all the old empires, and that is ignorance; the fact that the people were so poorly educated and so narrow in their experience with other nations that there was no considerable opposition to the theory that the emperor or king was divinely appointed and that the highest type of performance as a citizen was to blindly follow his wishes. As in every country in the world, the growth of popular education has brought on disturbances which have as their result the increasing independence of the private citizen and, since only a certain amount of authority can rest anywhere, the result has been a reduction of power in the hands of those who formerly held it all, and that is the nobility. There has been severe agitation for the extention of the franchise in Japan for the last 20 years and demands for a more powerful voice in the determination of government affairs have increased remarkably since the World War, so much so, that a series of ruinous strikes have lately occurred in the country and recent newspaper despatches from Japan tell of several of the large shipyards being in the hands of the workmen, with rampant indications of a socialism verging strongly upon the Russian sort.

THE CURE FOR LOCAL DISCONTENT

In 1894 Japan was in the midst of great unrest due to the increase of local taxation, and the China war, occurring either by fortune or by design at that time, brought all parties in the country to an enthusiastic concord. Just preceding the Russian War a similar condition existed in Japan and Mr. Bywater calls attention to the fact that discontent and the demands of the common people have never been so strong and insistent as they are at present; that a diversion of the people's minds from their local trouble has been persistently accomplished in the past by getting them excited over some question outside the country and that this maneuver is taking form at the present time in violent newspaper attentions to every event which may be interpreted as an unfriendly American action toward the Japanese. He leaves the conclusions to the reader.

It is interesting in the discussion of the expense of construction to see that Americans have been generally mistaken in the widely-held impression that our vessels cost us more than those built abroad. He finds that we have uniformly built ships similar to the British vessels at a cost slightly less than theirs. The *Utah* of 21,825 tons, and costing £1,701,100 is compared with the *Colossus* of 20,000 tons, built the following year at a cost of £1,730,000. So the battleship *Texas* of 27,000 tons cost less than the *King George V* which is 4000 tons lighter. The *Pennsylvania*, 4000 tons heavier than the *Queen Elizabeth*, cost about £100,000 more than the British ship but the *Pennsylvania* was built two years after the *Queen Elizabeth* went on the stocks.

The author goes thoroughly into the question of dockyards for the cleaning and repairing of large men-of-war and in this he finds us particularly crippled for operations in the Pacific. Lord Jellicoe called attention to the fact, in a speech after the War, that a graving dock is not a very spectacular affair; that no smoke comes out of the stack and no bow wave goes up from the front, but that one of them is distinctly more important to a fleet than any floating unit could ever be, and lasted longer and cost less to make. It is quite natural, however, and it is the case, that this very lack of being spectacular has prevented the popular mind from being easily attracted toward it, whereas it is not so much of an effort to canvas votes for a battle cruiser or some fast destroyers.

Concerning the Pacific docks, the title of the "Premier Yard" is given to Mare Island. Attention is called to the fact that the dredgers must be kept continually at work to make it available for the new ships. The developments at Bremerton are spoken of and there is mention also of the plans for a first class fleet base in San Francisco Bay, and the destroyer, submarine and aircraft stations at San Diego, San Pedro, at Tongue Point (on the Columbia River) and at Ediz Hook (State of Washington), but the whole Pacific dock equipment is said to be distinctly unable to respond to the demands which active service would put upon it. Going to the insular possessions in the Pacific, the question of dry docks is shown to be even less well provided for. In the whole of the Pacific as distinguished from the mainland of America there is but one dock capable of taking a dreadnought. We have at Pearl Harbor a new dock, a thousand feet long and 138 feet wide at the entrance. The only other docks which exist are at Cavite and Olongapo and these would be of no use to a modern heavy ship.

Hawaii is called the "Key to the Eastern Pacific," and with this, and a base in the Alutian Islands and one in the Canal, the strategy of that portion of the ocean is assumed to be well taken care of. This is particularly so as the distance from Japan to the American coast renders an active attempt to make a frontal attack with troops beyond the bounds of probability, and it is assumed that even light raiding forces would not be exempted from constant danger in the Eastern Pacific, excepting, of course, in a case of long-range, modern submarines.

The Board of Inspection which visited Pearl Harbor in 1919 reported that the docking, repairing and magazine accommodations would be entirely

insufficient for the needs of the Pacific Fleet in time of peace and even more insufficient if the whole American Fleet were gathered here for an offensive purpose. The proposals for improvement included building two concrete piers, 1800 and 1000 feet long respectively, a large foundry, machine and boiler shops, magazines, an oil fuel depot and a harbor railway; the building of another dry dock similar to the present one; the development of complete submarine and aviation bases and the dredging of a sufficient area in the present anchorage to allow for the comfortable berthing of eight dreadnoughts. It was also advised that the Government co-operate with the civilian authorities of Honolulu to develop the merchant harbor there in order that it might be utilized in time of war. In reviewing the extensiveness of these improvements, Mr. Bywater remarks that *they are matters of really primary importance, that they are much more in demand than a new battleship would be, that they would add more tactical efficiency to the fleet than a whole division of battleships, and that all the alterations together would cost less than one such vessel.*

GUAM

The real burden of the author's review of all the elements in the situation is that Guam is the most important of our possessions in the Pacific, with the possible exception of Hawaii, and that even if Hawaii were secure beyond any threat, its possession alone would in no way insure our ability to maintain our position in the Philippines or in any of the waters within several thousand miles of Japan. It is apparent that since Honolulu is 4400 miles from the Japanese coast our fleet could in no case be expected to emerge from its harbor and conduct blockading operations near Japan, nor could the fleet be expected to leave Honolulu and, upon arrival near the Japanese coast, find their opponent willing to emerge during the short period which our fleet could maintain itself there and join battle, when mere waiting would force the invaders back to their bases.

Various objections are advanced to building up Manila to be our real point of strength in Asiatic waters. For one thing, it is among islands which furnish a great number of available points of invasion and the most practical means of absolutely preventing a successful attack—that is, the maintenance of our full fleet in Manila—would be not only translated as a distinctly unfriendly move but would be a matter requiring the greatest expense in the transportation of supplies and the upkeep of the ships. On the other hand, Mr. Bywater points out that Guam may be prepared for a fleet base with relatively small expense. A combination of dredging, with outlying breakwaters, will provide anchorage in any magnitude desired. This island of course is barely self-supporting in even the essentials of food, and oil and cold storage, docking and repair facilities would have to be constructed before the fleet could find the harbor of any tactical value. However, the defense would in no way be as difficult to maintain as that of Manila. It could be made absolutely sure by local employment of heavy coast defense guns, mine-fields, and a strong

force of submarines and aircraft so that it would not require the steady presence of the fleet there, but could be securely protected, to furnish an arriving point for the main body of our forces in their progress toward the Asiatic Coast. Once the fleet were in Guam, it is pointed out that this is even a better "point d'appui" than anything in the Philippines and that the tenure of the latter islands by any force based in Japan would be practically impossible with a superior enemy force located at Guam.

This superiority the Americans possess at present and it is projected that it will be maintained. In the further discussion of dockyard necessity Mr. Bywater points out that if none existed in Guam, or if that island were in the hands of an enemy, *any vessel seriously injured in combat near the Asiatic Coast would almost certainly founder before it could be withdrawn as far away as Honolulu*, or failing in this, it would succumb to the attacks of aircraft, following destroyers and long range submarines which would undoubtedly accompany the remnants of a retreat. In a dozen places in this interesting volume the author comes back again and again to the demanding necessity for docking facilities in the Pacific and especially the primary importance of a great fleet establishment at Guam, with every facility for the dry-docking, supplying and repairing of all the vessels which would compose the sea-going force.

The author has a distinct criticism of our present fleet composition and of our building program. It is true, he thinks (and this is confirmed by the statements of the British Admiralty, our own Navy Department and the Japanese Naval Office), that the strength of the power at sea still remains in the heavy battleship and that while auxiliary types are required in sufficient numbers, they are useless unless the backbone of the fleet is there. In this regard, however, he makes it evident that while the backbone is necessary, there must be some arms and legs to the fleet, too, and proceeds to call attention to the fact that the necessity which we have always been under of using heavy, old, armored cruisers, or light destroyers, for the scouting and reconnoissance work which fast and sturdy light cruisers should do still exists, and that even our moderate program for turning out 10 of these craft will leave us distinctly inferior to both the Japanese and British in scouting ability. Even if the claims of aircraftsmen are acknowledged *in toto*, we yet remain behind both nations in scouting equipment. The Japanese are fast at work upon their aircraft carrier *Hosho* and the British, as we already know, have had several modern and capable aircraft carriers in actual operation for several years. He says that "if naval policy were governed solely, or even mainly, by practical consideration of tactics and strategy, the Americans would now be constructing battle cruisers and fast light cruisers to the exclusion of every other type, for it is certain that the want of such ships would most seriously handicap the fleet in any war-like operations." At present the British have 45 modern light cruisers and the Japanese eight. We are credited with none. In the building programs Great Britain is completing four of a very strong type, of which the *Hawkins* is one. The Japanese are constructing eleven in addition to their present equipment of eight, and we have ten under construction—the *Omaha* class.

The Japanese naval officer is described as being of a most ardent and zealous disposition. The author scouts the idea which grew up during the Chinese and Russian Wars that he is possessed of any more bravery or audacity than his brothers in other navies, or that any one nation has a lien on courage, but it is pointed out that they take their work in the most serious and thorough mood; that their course of instruction in school and aboard ships as young officers is of the most exacting sort and that the older officers themselves persist in the study and discussion of their work to the exclusion of almost any other subject. He recounts the case of a number of Japanese officers in England awaiting the completion of some vessels which the British were building for them. They were persistently at work as long as anyone remained in the yard, and on holidays and after working hours their idea of having a good time was to keep themselves busy with blue prints and sketches, or if the vacation were more extended, to go by train to visit some other dockyard all day and play war games at night. It is said that the restrictions guarding the entrance of the cadets into the officer branch of the Navy are such that only those of a very good social class are admitted and that these are practically restricted to the old Military Clan. In this regard, however, the recent demand in Japan for popular participation in governmental activities has broken down the barrier which once prevented boys of other than the finest social classes from entering the Navy and it is said that this career is gradually opening to boys of less prominence. This holds good in both the Army and the Navy to a small extent, but it is remarked that the old Military Clan still have things very firmly in their grasp in Japan and yield to the popular demand in just so large a measure as will placate it.

An excerpt from the proceedings of the Imperial Diet during the discussion of the last naval program is reproduced here as an example of the fact that the representatives in Japan are becoming very outspoken in their discussion of the government policy and that the progress of their Navy Department in securing the passage of legislation for building programs is impeded by much the same hurdles which prevent our own plans from running down a straight course. A member of the Diet interpellated the representative of the Admiralty as follows:

"For how long a period will the requirements of the Navy be covered by this Bill?"

"Admiralty reply: 'No definite answer can be returned to that question. The program now before you is the minimum consistent with our needs to the end of 1924. It is considered wholly adequate by the Imperial Navy Department, especially as regards the number of cruisers and submarines, these being types to which special importance is attached. Developments in the naval policy of foreign states cannot be ignored by us.'

"A Member: 'Does this program take cognisance of current naval expenditure in the United States and England?'

"Admiralty reply: 'Yes; it was not prepared until the extent of current naval expenditure by those two Powers was known to us. Any sub-

stantial additions which may be made by either of them would compel us to reconsider our own Budget.'

"A Member: 'Are we, then, building warships against the United States or England or both?'

"Admiralty reply: 'No: against neither. The Navy Department deprecates such suggestions. But it is obvious that our own program must be influenced by what is being done abroad. I am asked in what relation our Navy will stand to that of the United States when all the new construction authorized here and in America is afloat. The answer is, approximately, as 1 to 2; that is to say, we shall be about as half as strong as the United States in capital ships. That ratio would be disturbing, and perhaps inadmissible, but for certain corollary factors, *such as our superiority in cruisers, our proportionately larger personnel, and our more advantageous position.*'

"A Member: 'The political outlook must indeed be grave if the Navy Department feels warranted in demanding £68,000,000 for new warships at a time of such pronounced economic stress. The Committee would welcome a more detailed explanation of the Department's reasons for this heavy demand.'

"Admiralty reply: 'The program is dictated by requirements of strategy. It was not drawn up without earnest consideration or without due allowance being made for the country's financial situation. Every nation must, however, be prepared to make sacrifices if it desires to be safe from foreign aggression.'"

JAPANESE BUILDING FACILITIES

Taking up the matter of dockyards and building slips in the possession of the Japanese, the author calls attention to the enormous increase of Japanese building resources which was occasioned by the war. They are much better supplied with means for docking and repairing their fleet in case of a conflict in the Western Pacific than any other nation would be and the author points out that we have no accommodations of that kind at all. The table supplied by him shows that at present there are dockyards in Japan and the following capabilities:

"Dockyards capable of building hulls, machinery, and equipment for every type of warship, including dreadnoughts and battle-cruisers..... 4

"Dockyards capable of building hulls and machinery for warships up to and including cruisers..... 4 (or 5)

"Dockyards capable of building destroyers, submarines, minelayers, and smaller craft..... 10

"The resources tabulated above were available at the end of 1920, but two or three years hence they will have been greatly enlarged, and by that time the position may be as follows:

"Dockyards able to build Dreadnoughts 9
" " Light-cruisers 7
" " Destroyers 12
" " Submarines 10

"The five additional yards that will probably be able to construct dreadnoughts and battle cruisers by 1922, if not before, are the Asano, Mitsui, Suzuki, Uraga, and Yokohama establishments. Some of the smaller firms, which are quite capable of constructing destroyers and submarines, are not yet able to manufacture the machinery for these vessels. In regard to oil-engines for submarines, the total Japanese capacity in 1919 was estimated at twelve complete sets per annum, viz., four sets for large ocean-going boats, and eight sets for coastal submarines; but the present total is probably much higher. Motors suitable for propelling submarines are built in the Government shops at Kure, Yokosuka, and Sasebo, and also by five private companies: Mitsu Bishi, Kawasaki, Uraga, Suzuki, and Asano."

Attention is called to the popular belief that Japanese shipbuilders are considerably behind American or European ones in technical knowledge or in the items of workmanship which go into construction. This is called a fallacy; Mr. Bywater remarks that they have never been content to be subservient imitators of designs initiated abroad, but that they have always shown distinct boldness and originality in their conceptions of ships and equipment, and that the quality of work turned out by the government yards has always been distinctly high. The Japanese destroyers which served on anti-submarine and escort work in the Mediterranean were highly praised by foreign observers, and subsequent to their return home proceeded to attain speeds in excess of their trial performances, and this was in spite of their having been on continuous service under the most exacting war conditions.

"In addition, the Japanese evolved their own system of armor and under-water protection for large ships as a consequence of experiments made during 1917, 1918, and 1919, at the cost of about $3,000,000. They have developed their own water-tube boiler, which is said to have a higher steaming efficiency than any foreign type, and have proceeded to manufacture the heaviest ordnance and equipment, with their own modifications in rifling, breech mechanism and mounting. Her submarines are said to be not copies of European or American submarines at all, but to have been designed with a distinct eye for her own local requirements, and she has been credited with substantial improvements in naval explosives, projectiles, torpedoes and mines."

STRATEGY IN THE PACIFIC

Under this head attention is called to the separation of the American Navy into two fleets which occurred in 1919 and which resulted in our putting a strong force in the western ocean. This division of force has been persistently criticized because it was contrary to the root principle of all military axioms, and the writer notes that it was only attempted after two conditions were fulfilled; first, that each of the two units is strong enough to carry on a first-class engagement with any possible enemy; and second, that the Panama Canal is now constructed, which allows the two fleets to be merged when the necessity arises. He has

one warning remark to make on this point, however, which is to the effect that it is an experience which is very common, that no force has ever been found to be effective in war which was not trained under a single command during the days of peace. Concerning the assumption that the Canal would be maintained in a useful condition during hostilities, the defenses of that waterway are described in very accurate detail and the conclusion drawn that they are thoroughly adequate. The chance exists, of course, that a vessel loaded with explosives might get into the Canal and blow herself up while in a lock, but the memory of the rigorous inspections which preceded the passage of any vessel through the Canal during the late war will reassure any who are made apprehensive by the recount of how simple an operation this would be.

In reviewing the situation which would probably exist in the case of an outbreak of war with Japan, the author assumes that the American naval command would be faced by the necessity of coming to a decision as to whether it intends to wage an offensive war against the enemy, or to conduct a purely defensive operation designed to protect the American mainland from invasion. In the latter case it is assumed that no difficulty will be had. With Honolulu as an outpost and the whole Pacific between the enemy's coast and our own, the possibility of a sustained, frontal attack by a Japanese Fleet is scouted as being absurd. It is made apparent that the sensible thing for the Japanese to do would be to stay at home and await the attack in waters which are close to their bases and fuel supplies. If it be assumed that we could occupy a dignified position by remaining at home ourselves, it has only to be pointed out that Japan has no possessions near our coast and that we have Guam and the Philippines within easy reach of her; that neither of them is defended by a force which would tax her fleet's strength to reduce; that our small cruiser force in the Asiatic would probably be eliminated in the first week of trouble and that with the downfall of Guam and the Philippines, the situation would be such that it could hardly be expected that American national pride would allow a termination of hostilities in that condition. If the matter were ended at that point, it would certainly be adjudged that this had been a defeated nation.

It is therefore perfectly evident that an offensive campaign would be forced upon this nation, whether we wished it or not and this means, of course, that our Fleet would be obliged to move over-seas to the locality of the enemy's home bases. It is 4400 miles from Honolulu to the Japanese coast, and without going into any particulars of fuel consumption and the necessity of fast speed and zigzagging in various areas to escape submarine attack and of the long return home after a fight, it is apparent that Honolulu is too distant for any base of operation of surface ships in the vicinity of the Asiatic mainland. A few long-distance submarines might arrive there, but it is apparent that that is not enough; that the tactics of conflict would necessarily be bent toward bringing the Japanese main fleet to a victorious action or, failing in this, to blockading the Japanese coast to such an extent that the islands could be starved into submission.

A BASE IN THE EAST

The existing defenses of the Philippines and Guam are detailed by the author, and it is assumed that their reduction by Japanese forces within two weeks of the declaration of war would be matters of perfect assurance. In Guam there is practically nothing to withstand a heavy bombardment. Public declarations from our own writers have repeatedly asserted that the overwhelming of the weak forces in the Philippines would be a matter of ease, and have made it evident that these islands must be defended by the fleet or not at all. It becomes further evident that this fleet must have a protected base in either the Philippines or Guam where it may be stationed previous to a war, or to which it can be sent, with a perfect assurance of its being guarded in port after its arrival. The first condition, which would presume that our main fleet be kept in the Philippines, is one that may be dismissed. Its fuel and food and transfer of personnel would be matter of such heavy consideration, and its presence would be such an apparent offense to the Japanese, that it is not economical of time to consider it.

The author calls attention to the great number of possible landing places which the islands in the Philippine group have and the fact that Guam, on the other hand, may be easily and thoroughly defended with heavy coast defense artillery, mine fields, and local forces of submarines and aircraft. The ability of submarines and aircraft to defend a shore base which has no fear of an attack from the rear has certainly become almost an axiom in the last few years, and the defense of Guam as compared to that of the Philippines would seem to be a much simpler affair.

On the assumption that the Philippines have succumbed to attack and that a first-class base at Guam remains to harbor our main fleet upon its arrival, the reader is led to consider the progress of the American Fleet across the Pacific from Hawaii. The zeal of the Japanese at the Peace Conference in securing the supervision of the former German islands north of the equator is easily explained by the flanking position which these islands occupy along the only route of transport from America to the Orient and the knowledge that there are many spots in these islands which can be quickly and easily converted into excellent centers of operation for aircraft and submarines. The line to Guam is flanked by the Marshall Islands, some 1500 miles to the east, and these contain the harbor of Jaluit, in which the Germans had begun a base for naval operations before the Great War. The Caroline Islands come next, to the west, with harbors at Pulap and Ponape. To the north of Guam lies the Marianne group, with an excellent base at Saipan. There are in addition, to the west of Guam and lying directly along the route between it and the Philippines, Yap and the Pelew Islands, the latter containing a good harbor at Anguar, where the *Emden* coaled before setting out on her raiding expeditions. It is assumed that in spite of the experience which the United States derived from the transport of a huge army to Europe during the late war, the losses attending the transfer of our fleet and landing forces to Guam would necessarily be of a considerable amount, but that the

main force would, with any reasonable bit of luck, get through, and once in Guam (providing it were properly fortified), this fleet would be perfectly safe to rest, re-fuel, and prepare for further operations from that base. Without Guam, the whole operation is assumed by the author to be perfectly futile.

Mr. Bywater shows to what extent the accumulation of the Japanese population in the big cities and in their lately-grown manufacturing establishments has caused a shortage in the crops which used to supply the people; the fact that she now imports about one-fifth of her rice crop from British India and South China, and that the mobilization of the army would still further withdraw men from the productive branches and include them in those forces which eat supplies without sharing in their production. With Guam in the hands of an enemy who is superior to them in main fleet composition, in other words an enemy so strong that the Japanese main fleet would be unable to defeat it in a major engagement, the continuation of transport or merchant shipping lines from the Japanese Islands to the Philippines and South China would be greatly endangered. It is to be assumed that cruiser operations (and our notorious shortage in these ships is pointed out as a reason why we would not secure the greatest benefits from the situation), would either stop the traffic south of the Japanese Islands or lead to the defense of the sea lanes by such Japanese forces as would eventually bring to two fleets into conflict. In this event, as the Japanese Fleet as constituted at present is several knots faster in most of its units than ours, it may be assumed that they would endeavor to fight at as long a range as possible in order to avoid the withering punishment of our much superior broadsides. *If we were not in possession of Guam, and had to return clear to Honolulu subsequent to an engagement, it is apparent that their strategy would be to avoid a decisive engagement; to inflict what damage they could without being overwhelmingly battered and to take advantage of their superior speed to retire upon the bases near them in their own islands. After the termination of a heavy battle in Japanese waters we would be left to return some forty-four hundred miles across the ocean, harassed by aircraft, following submarines, and light cruiser and destroyer forces which would pick off all the wounded and crippled ships. It is also apparent that vessels which were holed at all badly could not be successfully towed nor could they propel themselves to Honolulu without almost a certainty of succumbing on the way. With Guam in our possession, however, as a thoroughly equipped modern base, we would probably have to return no farther to our own center of operations than the Japanese would to theirs, and with the Japanese unwilling to come to a final decisive engagement, their lines of communication (and that means their sources of food and trade), would inevitably be surrendered.*

The financial situation in both countries is detailed, with the evident superiority in the favor of the United States and the author goes to considerable extent to demonstrate that the Japanese Islands can neither support a long, heavy warfare financially, nor can they support them-

selves for an extended period with the food they grow at home. He approaches the subject from many angles and from all the sources which contribute in any way to the carrying on of a war, and the answer in every case is "Guam." *He calls attention to the fact that we have built and are building a splendid fleet, but that however powerful it is, if there is no safe base in the East to which to direct it and in which it may repair, dock and replenish its fuel, it is an absolute inutility;* that the strategy of the Pacific and its great distances will render it of no use in spite of its powerful equipment, and that for distinctly less than the cost of several dreadnoughts, Guam and the line to the East may be made absolutely safe to us.

In the end it may be said that this book is a most illuminating discussion of the political and strategical situation which is now occupying the attention of the world. As in every case where a civilian goes about a discussion of affairs of war, the details are taken up in the most evident and convincing form. It was intended for civilian consumption and does not need a trained military mind to understand. On the other hand, naval and military men will find it a most comprehensive and plainly-expressed review of the irritating features existing between the two countries, the possibilities of conflict, and the very likely form which that conflict would take.

J. M. C.

"A Text Book of Oceanography." By J. T. Jenkins. Price $6.00. (New York: E. P. Dutton & Co.)

The book is designed primarily as a text book of oceanography for students in institutions of learning, especially in Great Britain and Ireland since many of the pertinent illustrative features are drawn from the literature of oceanography in relation to the seas surrounding the British Isles. This volume possesses a range of usefulness extending far beyond the classroom, for, besides presenting phases of oceanographical interest to the biologist, the chemist, the geologist, and the physicist, and besides serving to show the conspiring interests of the cognate sciences in the field of oceanography, it has a predominant value to the seafarer. Fully one-half of its contents is devoted to the discussion of the currents and tides, and the rest is a brief summing up of the outlines of the present state of knowledge in relation to the physical geography of the sea, in which are often reflected the advancements that have proceeded from the lately conducted investigations of the International Council for the Exploration of the Sea.

L. H. C.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-eighth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, $3.50; enlisted men, U. S. Navy, $3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ARTICLE, 1922

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1921 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1921. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1921 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

F. M. ROBINSON,
Commander, U. S. N., Secretary and Treasurer.